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U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

OFFICE OF TECHNICAL SERVICES
Donald A. Schon, *Director*

Issued twice a month. Annual subscription $15 ($3.75 additional for foreign mailing). Single copy $1. Make remittance payable to Superintendent of Documents and mail either to a U.S. Department of Commerce Field Office or to Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Address changes should be sent to Superintendent of Documents.

Contents may be reprinted freely. Mention of source will be appreciated.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, June 30, 1961.

U.S. Government Research Reports

This publication is issued twice a month to announce new reports of research and development released by the Department of Defense and certain other agencies of the Federal Government sponsoring research and development programs. Unless otherwise indicated, reports listed are available from the Office of Technical Services. The documents are available in original, reproduced, or microfiche copy only.

The first section of U. S. Government Research Reports (USGRR) is prepared for the Defense Documentation Center and is called "Technical Abstract Bulletin" (TAB). (DDC is a Department of Defense agency which services DOD agencies and their contractors with military research information.) The next section is called "Non-Military and Older Military Research Reports." Here are listed new reports of civilian agencies of the Government and military research reports not to be found in the "TAB." Most of these older military reports have been acquired by OTS in response to specific industry requests.

Atomic Energy Commission reports available from OTS are listed in Nuclear Science Abstracts. NSA is available to the general public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at $30 a year (domestic), $37 a year (foreign). Single copy cost, $1.75 (plus 25 percent for foreign mailing).

National Aeronautics and Space Administration reports available from OTS are listed in Scientific and Technical Aerospace Reports. STAR is available to the general public on subscription from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at $25 a year (domestic), $31 a year (foreign). Single copy, $1.50 (plus 25 cents for foreign mailing).

How To Order Reports

Almost all reports listed in USGRR are available from the Office of Technical Services, U. S. Department of Commerce, Washington, D. C., 20230, or may be ordered through any Department of Commerce Field Office. Prices are given with each entry. Hard copy price is indicated by the letters "HC"; microfiche price is indicated by the letters "MF." Please use the identification numbers (AD number, PB number) and titles of reports when ordering. Also use accession numbers when ordering documents listed in NSA and STAR. Prepayment is required or purchases can be charged to Superintendent of Documents deposit accounts.

For reports available from GPO only, address your order and make check or money order payable to Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., 20402.

When any report is available from a source other than OTS or GPO, the name and address of that source will be given. Direct your order to that address and not to OTS.

NOTICE TO SUBSCRIBERS

New Standard Pricing Schedule

For

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The new OTS pricing schedule for original or reproduced copies is retroactive except where the previously announced price of printed documents is lower. When the existing stocks of printed documents are depleted and must be reproduced, the new price schedule will apply. Normally, documents which were announced more than one year ago will not be in printed form. The new standard schedule in general is 1/3 lower than the average previous prices.

Standard Price Schedule for Original or Reproduced Copies (HC)

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1 - 25	$1.00
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OTS has changed its system of microphotography from microfilm to microfiche (a unitized sheet form of microphotography). All documents announced by OTS subsequent to July 15, 1964, are available either in original, reproduced, or microfiche copy only.

OTS will use the International Standard size of microfiche sheet of 105 mm. x 148 mm. (approximately 4" x 6"). Image size will be generally an 18:1 reduction. If a document contains 57 pages or less, normally only one sheet of microfiche will be necessary. "Trailer cards," or cards in addition to the first will be used for the additional pages.

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Automatic Distribution of all reports or all translations available from Clearinghouse in microfiche	$ .25 for 1st sheet plus .25 for each trailer sheet
Additional copies of the same document requested with the original order	$ .25 for 1st sheet plus .25 for each trailer sheet

*Automatic distribution by subject category, through advance subscription, will be announced in the near future.

Pricing schedules for sale of magnetic (computer) tapes, new journals, catalog cards, fee literature searches, and other bibliographic materials will be announced later.

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SPECIAL LITERATURE SEARCHING FEE INCREASED

Effective October 1, 1964, the fee for Special Literature Searches by the Office of Technical Services and the Science and Technology Division, Library of Congress, was increased from $8 per hour to $11 per hour of searching time. The increase is necessary to permit the agencies to recover the actual costs of these searches.

The Special Literature Searching Service is a subscription-type service to provide subscribers with bibliographic information tailored to their specifications. For information on this service, write to OTS, U. S. Department of Commerce, Washington, D. C. 20230.

Microphotography

All documents entering tne OTS collection as of July 15, 1964 will be available on microfiche (a unitized sheet form of microphotography) as well as full-size reproduction. The International Standards Organization size of 105 mm. x 148 mm. (approximately 4"x6") sheets of microfiche will be used. Image size will be generally an 18:1 reduction. If a document contains 57 pages or less, normally only one sheet of microfiche will be necessary. "Trailer sheets", or sheets in addition to the first for longer reports, will contain somewhat more pages.

OTS is changing its system because most Government agencies are converting to microfiche and because microfiche has the following advantages over microfilm:

Costs less to produce
Rapid production
Rapid dissemination
Simple to file
Fast Retrieval
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Microfiche prices are included in the entries. Microfiche viewing and reproduction equipment is available from several U. S. and European companies.

Abstract Journals

The USGRR, beginning with the August 5 issue, contains listings and abstracts of only that material not listed and abstracted in other journals. There are four specialized journals abstracting documents available from OTS:

U. S. Government Research Reports -- Documents not listed in the other journals.
Technical Translations -- All translations.
Nuclear Science Abstracts -- AEC documents.
Scientific and Technical Aerospace Reports -- NASA documents.

Subscription prices for these publications are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20204.

Improved Customer Service

In connection with the above developments, OTS is consolidating all its documentation operations, including printing and document storage and dissemination, in one building. All services to the customer should be greatly improved, including more prompt servicing of orders for documents.

NOTICE TO SUBSCRIBERS ABOUT RECENT OTS CHANGES

Recent developments aimed at strengthening and broadening the OTS program, under Public Law 776 - 81st. Congress, for the collection and distribution of Government research and development reports will result in some important changes directly affecting OTS customers. Changes just made include document prices and method of microphotography. In the future, changes in the price of literature searching and in the composition of the USGRR, and possibly other changes, will be made and announced.

An interagency agreement, announced by the White House on February 28, called upon the Department of Commerce to strengthen and broaden the functions of OTS under Public Law 776 to make the agency more effectively a "Clearinghouse for Federal Scientific and Technical Information."

Steps to develop such a Clearinghouse are being taken as rapidly as possible, and the Office of Technical Services has been extensively reorganized to effectively carry out the expanded functions.

The Clearinghouse provides a single point of contact through which current research efforts and the results of Government-sponsored research in science and technology can be made available to industry, commerce, and the general public. The Clearinghouse collects, organizes, publicizes, and provides reference, referral, and sales services for technical reports and translations received from domestic and foreign sources. The primary aim of the Clearinghouse is to achieve through interagency agreement and cooperation a unified documentation and distribution system for Government-generated technical reports and information on research in progress.

Another significant development, in line with the interagency agreement, was the signing on March 9 of an agreement between the Department of Commerce and the Department of Defense providing for OTS to handle all processing and distribution of unclassified/unlimited DOD reports, a function formerly performed largely by the Defense Documentation Center, except that OTS was responsible for announcement, reproduction, and sale of these documents to the public.

Prices

OTS has always been required by Public Law 776 to operate its reproduction and distribution program on a self-supporting basis. For some time, OTS has had one price for printed documents and another for documents reproduced by "blow-back" from microfilm. In order to establish a single pricing schedule, and one which will return costs of reproduction and handling, the agency has established a new price for all original or reproduced documents which on the average are 1/3 lower than the previous pricing schedule, as shown by the following table.

Price Comparison of New Standard Price with Present Dual Pricing Schedule

Pages	% Sales	Printed	Xerox	Average Present Price	New Standard Price
1 - 25	41.5	$ .50	$ 2.10	$ 1.30	$ 1.00
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101 - 150	7.0	2.50	11.00	6.75	4.00
151 - 200	5.5	3.00	13.50	8.25	5.00
201 - 300	4.8	3.50	18.50	11.00	6.00
301 - 400	1.2	5.00	21.00	13.00	7.00
401 - plus	2.2	6.00 plus	22.75 plus	14.38 plus	7.00 plus .01/page in excess of 400 pages

FEDERAL REGIONAL TECHNICAL REPORT CENTERS

Each of the Federal Regional Technical Report Centers listed below contains a collection of USAEC, NASA, and DOD unclassified reports as well as reports of other U. S. government agencies and provides reference, interlibrary loan, and reproduction services.

University of California
General Library
Berkeley, Calif. 94704

University of California
University Library
Los Angeles, Calif. 90024

Library of Congress
Science and Technology Division
Washington, D. C. 20540

Georgia Institute of Technology
Price Gilbert Library
Atlanta, Ga. 30300

The John Crerar Library
35 West 33rd St.
Chicago, Ill. 60616

Massachusetts Institute of Technology
M. I. T. Libraries
Cambridge, Mass. 02139

Linda Hall Library
5109 Cherry Street
Kansas City, Mo. 64100

Columbia University
Engineering Library
Seeley W. Mudd Building
New York, N. Y. 10027

Carnegie Library of Pittsburgh
4400 Forbes St.
Pittsburgh, Pa. 15213

Southern Methodist University
Science Library
P. O. Box 1339
Dallas, Tex. 75222

University of Colorado
Boulder, Colo. 80301

University of Washington Library
Government Documents Center
Seattle, Wash. 98105

CUMULATIVE INDEXES

The following Cumulative Indexes for U. S. Government Research Reports are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., 20402:

Volume 38	Annual Cumulative Index January - December 1963 Includes "Non-Military and Older Military Research Reports" section only.	$1.00
	Cumulated Index May - December 1963 Includes Technical Abstract Bulletin only.	$3.50
	Collective Index 1 January - 1 May 1963 Includes Technical Abstract Bulletin only.	$3.50
Volume 37	Annual Cumulative Index January - December 1962 Includes "Non-Military and Older Military Research Reports" section only.	$1.00
	Semi-annual Cumulative Index July - December 1962 Includes Technical Abstract Bulletin only.	$3.50
	Semi-annual Cumulative Index January - June 1962 Includes both Technical Abstract Bulletin (TAB) and "Non-Military and Older Military Reports" sections.	$3.50
Volume 36	July - December 1961	$3.50
Volume 35	January - June 1961	$1.00
Volume 34	July - December 1960	$1.00
Volume 33	January - June 1960	$1.00
Volume 32	July - December 1959	$1.00

For information regarding the availability of earlier indexes write to Office of Technical Services, U. S. Department of Commerce, Washington, D. C. 20230.

TECHNICAL ABSTRACT BULLETIN

1. Aircraft and Flight Equipment

AD-605 143 Div. 1, 30
OTS Prices: HC $4.00/MF $1.00

Institute of Tech., Univ. of Minnesota, Minneapolis.
THEORETICAL PARACHUTE INVESTIGATIONS.
Progress rept. no. 17, 1 Mar-31 May 61.
31 May 61, 142p
Contract AF33 616 8310

Unclassified report

Descriptors: (*Parachutes, Aerodynamic characteristics), Drag parachutes, Cargo parachutes, Ribbon parachutes, Wind tunnels, Subsonic flow, Supersonic flow, Model tests, Wake, Stability.

Contents:
Investigation of wake effects on the behavior of parachutes and other retardation devices behind large bodies at subsonic and supersonic speeds
Investigation of basic stability Parameters of Conventional Parachutes
Determination of the Minimum Sized Parachute for Stabilization of General Aerial Delivery Cargo
Theoretical study of supersonic parachute phenomena
Theoretical Analysis of the Dynamics of the Opening Parachute
Statistical analysis of extraction time, deployment time, opening time, and drag coefficient for aerial delivery parachutes and systems
Study of basic principles of new parachutes and retardation devices
Vortex Ring parachute study
Gliding aerodynamic decelerator
Ribbon grids for supersonic flow
Study of flow patterns of aerodynamic decelerators by means of the surface wave analogy
Stationary model water channel
Stress analysis of the T-10 Troop Parachute

AD-605 144 Div. 1, 30
OTS Prices: HC $5.00/MF $1.00

Institute of Tech., Univ. of Minnesota, Minneapolis.
THEORETICAL PARACHUTE INVESTIGATIONS.
Progress rept. no. 21, 1 Mar-31 May 62.
31 May 62, 176p
Contract AF33 616 8310, Proj. 6065, Task 60252

Unclassified report

See also AD-605 143

Descriptors: (*Parachutes, Aerodynamic characteristics), Drag parachutes, Cargo parachutes, Ribbon parachutes, Parachute fabrics, Wind tunnels, Model tests, Subsonic flow, Supersonic flow, Wake, Stability.

Contents:
Investigation of wake effects on the behavior of parachutes and other retardation devices behind large bodies at subsonic and supersonic speeds
Investigation of basic stability parameters of conventional parachutes
Theoretical study of supersonic parachute phenomena
Theoretical analysis of the dynamics of theopening parachute
Statistical analysis of extraction time, deployment time, opening time, and drag coefficient for aerial delivery parachutes and systems
Gliding aerodynamic decelerator
Effective porosity studies
Study of flow patterns of aerodynamic decelerators by means of the surface wave analogy
Stress analysis of the T-10 Troop Parachute

AD-605 170 Div. 1, 9
OTS Prices: HC $3.00/MF $0.75

Hydraulic Engineering Lab., Univ. of California, Berkeley.
RESEARCH ON ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE OPERATING OVER WATER; PRELIMINARY STUDY OF AIR FLOW PATTERNS. APPENDIX: DIMENSIONAL ANALYSIS,
by J. D. Cumming and Gunnar Sigurdsson. May 64,
70p IER-187-6
Contract Nonr222 71, Proj. NRO62 231

Unclassified report

Descriptors: (*Ground effect machines, Gas flow), Wake, Lift, Jets, Design, Models (Simulations), Water, Geometry, Mathematical analysis, Nozzles.

The annular nozzle ground effect machine model was mounted rigidly on a carriage with its base plate horizontal. Air was supplied by an air compressor driven by a variable speed DC motor. The air flow rates were measured with a calibrated 2 inch orifice in the inlet pipe to the blower. The carriage was run at forward speeds varying between 0 and 3.5 knots. The height above the water level (before the blower was turned on) was set at 1/2 in., 1 in., or 1-1/2 in. Air flow rates between 7 and 15 lbs/min (0.115 and 0.256 lbs/sec) were used.

AD-605 172 Div. 1, 2
OTS Prices: HC $3.00/MF $0.75

National Weather Records Center, Asheville, N. C.
CLIMATIC STUDIES FOR PROPOSED LANDING SYSTEM FOR JOHN F. KENNEDY INTERNATIONAL AIRPORT (IDLEWILD), NEW YORK, NEW YORK,
Final rept.
Jun 64, 86p
Proj. 114 20R
FAA RD64 54 V10

Unclassified report

Descriptors: (*Climatology, All-weather aviation), (*All-weather aviation, Landing aids), (*Landing aids, All-weather aviation), Landing fields, New York.

This report is one of 32 volumes of climatological data for 32 different major airports. Ceiling, visibility, wind and weather information is grouped seasonally and by various periods of the day. Various weather categories are tabulated, in most cases from 10 years of data, to act as an aid in making decisions affecting the landing systems at these 32 air terminals. (Author)

AD-605 173 Div. 1, 2
OTS Prices: HC $3.00/MF $0.75

National Weather Records Center, Asheville, N. C.
CLIMATIC STUDIES FOR PROPOSED LANDING SYSTEM FOR INTERNATIONAL AIRPORT, MINNEAPOLIS, MINNESOTA,

Six experiments were conducted to measure the transient character of the airloads induced by the interaction of blast generated shock waves on a moving airfoil. The tests were conducted on a rigid (airloads) model of swept planform, similar in type to a B47/B52 aircraft. Airfoil motion was simulated by the shock tube which produced a jet flow of Mach 0.7. Shock waves were generated by explosive charges which were varied in sized and proximity to obtain airloads on the wing that changed both the angle of attack and blast duration through a range from small to large. The wing specimens were heavily instrumented with pressure transducers to measure the time history of the variation in the airloads. Response of the wing to the airloads was measured by strain gages and accelerometers. Pressure instrumentation was also used to measure the character of the blast environment. Blast parameters were varied to obtain induced airloads with nominal values for the angle of attack of 8, 20 and 30 degrees. At each of these angles of attack, an experiment was run with a short and long duration shock wave to study the effect of decay rate on the airloads. (Author)

AD-605 671 Div. 1, 9
OTS Prices: HC $4.00/MF $0.75

Institute of Tech., Univ. of Minnesota, Minneapolis.
THEORETICAL PARACHUTE INVESTIGATIONS.
Progress rept. no. 23, 1 Sep-30 Nov 62,
by H. G. Heinrich, T. Riabokin, S. K. Ibrahim, E. L. Haak, and R. K. Niccum. 30 Nov 62, 118p
Contract AF33 616 8310, Proj. 6065, Task 60252
Unclassified report

See also AD-605 144

Descriptors: (*Parachutes, Aerodynamic characteristics) Cargo parachutes, Ribbon parachutes, Configuration, Deceleration, Wake, Dynamics, Wind tunnels, Parachute fabrics, Models (Simulations), Stability, Statistical analysis.

Contents: Investigation of wake effects on the behavior of parachutes and other retardation devices behind large bodies; Investigation of basic stability parameters of conventional parachutes; Theoretical study of supersonic parachute phenomena; Theoretical analysis of the dynamics of the opening parachute; Statistical analysis of extraction time, deployment time, opening time, and drag coefficient for aerial delivery parachutes and systems; Gliding aerodynamic decelerator; Effective porosity studies; Study of flow patterns of aerodynamic decelerators by means of the surface wave analogy; Stress analysis of the T-10 troop parachute; Aerodynamic characteristics of the parachute stabilized A-21 cargo container; Aerodynamic characteristics of the cross and wagon-wheel type parachutes; Determination of mass flow through parachutes with inherent geometric porosity.

AD-605 702 Div. 1, 12, 14
OTS Prices: HC $2.00/MF $0.50

Mechanical Technology, Inc., Latham, N. Y.
INVESTIGATION OF COMPLEX BEARING AND/OR LUBRICATION SYSTEMS.
Quarterly progress rept. no. 4, 1 Feb-4 May 63,
by P. Lewis, S. F. Murray, and M. B. Peterson.
6 May 63, 36p MTI-63TR19
Contract AF33 657 8666
Unclassified report

See also N63-17684.

Descriptors: (*Bearings, Scientific research), (*Lubricants, Bearings), Test equipment, Loading (Mechanics), High-temperature research, Atmosphere, Vacuum, Powders, Impellers, Temperature, Flight.

The objective of the program is to conduct research on complex bearing and/or lubrication systems for flight accessory equipment to operate at temperatures from -65F to 1500F, in high vacuum or normal atmosphere, and while exposed to nuclear radiation. The target specifications are for a self-contained bearing system which will operate at 30,000 rpm.

AD-605 828 Div. 1
OTS Prices: HC $3.00/MF $0.75

Sikorsky Aircraft, Stratford, Conn.
MEASUREMENT PROGRAM TO DETERMINE STATIC ELECTRICITY CHARGING CURRENTS IN HELICOPTER MAIN ROTOR BLADES.
Rept. for Jun 62-Aug 63,
by Samuel Baron, Edward Cholakian, and Thomas M. Coonan. Jun 64, 64p
Contract DA44 177TC844, Proj. 1D121401A14130
TRECOM TR64 14
Unclassified report

Descriptors: (*Rotor blades (Rotary wings), Static electricity), Helicopters, Electric currents, Voltage, Environmental tests, Electrostatics, Meteorological parameters, Insulation (Electric), Measurement.

A SH-3A main rotor blade was electrically insulated from the rotor head and connected to measuring apparatus to determine to what extent the main rotor blades contributed to the electrostatic charges on helicopters. Testing was performed on test stands and on a SH-3A helicopter in various environmental conditions. It was found that in clear-air conditions (no snow, sand, rain, etc.) electrostatic charging current due to main rotor blades is relatively small compared to the helicopter's total current; however, in environmental conditions (snow, sand, rain, etc.) the main rotor blades are the major contributors of electrostatic charging current. (Author)

AD-605 841 Div. 1, 9
OTS Prices: HC $6.00/MF $1.25

Autonetics, Anaheim, Calif.
GUST ALLEVIATION FEASIBILITY STUDY.
Final rept.
comp. by John D. Balducci, F. LeRoy Adams, and Milton A. Schwartzberg. Apr 64, 262p
Contract DA44 177AMC858T, Proj. 1D131201D 159
TRECOM TR64-1
Unclassified report

Descriptors: (*Gust loads, Control systems), (*Aerodynamic control surfaces, Feasibility studies), Aerodynamic loading, Gusts, Atmospheric motion, Variable-sweep wings, Flaps, Elevators, Lift, Stability, Costs, Weight, Pilots, Performance (Human).

The report, based on a detailed analytical effort, provides a realistic appraisal of the capabilities of known gust alleviation systems and determines the feasibility of utilizing these systems in future aircraft intended for sustained low level, high-subsonic-speed operations. Gust alleviation systems are defined as methods which intentionally or incidentally reduce vertical aircraft loading resulting from atmospheric turbulence. The study considers a number of proposed systems and theoretical techniques. The systems fall into one of two broad categories: feedback control, termed active alleviation and aircraft geometry alteration, termed passive alleviation. Evaluation criteria include alleviation capability, pilot tolerance and endurance, stability, control, performance, structural effects, weight, cost, reliability, and fail-safety. It is concluded that either a normal acceleration feedback system controlling flaps and elevators or a variable sweep wing design offers the most attractive method of obtaining desirable alleviation. (Author)

Final rept.
Jun 64, 86p
Proj. 114 20R
FAA RD64 54 V5

Unclassified report

Descriptors: (*Climatology, All-weather aviation), (*All-weather aviation, Landing aids), (*Landing aids, All-weather aviation, Landing fields, Minnesota.

This report is one of 32 volumes of climatological data for 32 different major airports. Ceiling, visibility, wind and weather information is grouped seasonally and by various periods of the day. Various weather categories are tabulated, in most cases from 10 years of data, to act as an aid in making decisions affecting the landing systems at these 32 air terminals. (Author)

AD-605 174 Div. 1, 2
OTS Prices: HC $3.00/MF $0.75

National Weather Records Center, Asheville, N. C.
CLIMATIC STUDIES FOR PROPOSED LANDING SYSTEM FOR LA GUARDIA FIELD, NEW YORK, NEW YORK.
Final rept.
Jun 64, 84p
Proj. 114 20R
FAA RD64 54 V11

Unclassified report

Descriptors: (*Climatology, All-weather avaiation), (*All-weather aviation, Landing aids), (*Landing aids, All-weather aviation), Landing fields, New York.

This report is one of 32 volumes of climatological data for 32 different major airports. Ceiling, visibility, wind and weather information is grouped seasonally and by various periods of the day. Various weather categories are tabulated, in most cases from 10 years of data, to act as an aid in making decisions affecting the landing systems at these 32 air terminals. (Author)

AD-605 246 Div. 1
OTS Prices: HC $5.00/MF $1.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AIR INTAKE DEVICES OF SUPERSONIC AIRCRAFT,
by Yu. N. Nechaev. 24 Aug 64, 178p
FTD MT64 301; TT 64 71298

Unclassified report

Edited machine trans. of mono. Vkhodnye Ustroistva Sverkhzvukovykh Samoletov, Moscow, 1963, p. 1-140.

Descriptors: (*Air scoops, Engine air systems components) (*Jet engine inlets, Turbojet engines), Supersonic planes, Supersonic diffusers, Gas flow, Fluid dynamic properties, Shock waves, Malfunctions, USSR.

The book acquaints the reader with diagrams, principles of installation and processes in air intake devices of supersonic aircraft. Basic attention is given to description of gas-dynamic processes of intake with ferry diffusers which have obtained wide propagation. In the book are considered conditions of work of intake supersonic diffusers of turbojet engines under different conditions of flight and operating conditions of power plant. Possible failures and malfunctions are analyzed and also the physical processes, occurring during unstable work of diffusers are described. Measures are expounded for preventing unstable work, including adjustment of diffusers. (Author)

AD-605 301 Div. 1, 12
OTS Prices: HC $1.00/MF $0.50

Sea-Space Systems, Inc., Torrance, Calif.
SKYHOOK BALLOON RESEARCH.
Final rept. for 24 Feb-31 Aug 64,
by Dale W. Cox. 31 Aug 64, 8p
Contract Nonr4395 00, Proj. NR211 085

Unclassified report

Descriptors: (*Balloons, Launching), Balloon equipment, Flight paths, Payload, Inflatable structures, Failure (Mechanics), Test equipment, Trajectories.

Flight profiles, flight trajectories, launch and flight descriptions and post flight analyses of problems or failures are provided for the balloon launches. The objective of the tethered launch was to test the Sea-Space dynamic launch system and the payload pickup capability of a dummy MER P balloon. A full scale, identical weight, dummy balloon was used.

AD-605 325 Div. 1, 14, 17
OTS Prices: HC $2.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
ENGINEERING SURVEY OF AIRCRAFT STRUCTURAL FAILURES CAUSED BY CORROSION, FATIGUE, AND ABRASION.
Final rept. for 10 Jun 63-31 Jan 64,
by Gene Nordby and W. C. Crisman. Jul 64, 36p
Contract DA44 177AMC98T, Task 1D121401A14203
TRECOM TR64 36

Unclassified report

Descriptors: (*Airframes, Failure (Mechanics)), Aircraft, Helicopters, Corrosion, Fatigue (Mechanics), Abrasives, Erosion, Bonded joints, Metals, Rotor blades (Rotary wings), Honeycomb cores.

A survey of Army aircraft structural failures caused by corrosion, Fatigue, and abrasion was made to define critical areas of future structural research. The primary source of data was the Army failure reports, 'Equipment Improvement Recommendation'. Because of the great number of reports available, a sampling was made consisting of basic airframe failures on four helicopters and two fixed-wing aircraft for the period 1 January 1963 to 31 August 1963. The reports were analyzed individually, and the data were consolidated. Analysis of all data revealed four significant problem areas: (1) corrosion and fatigue of primary airframe structure; (2) separation of metal bonded joints on rotor blades; (3) erosion of rotor blade leading edges; and (4) sustaining rotor blade balance. (Author)

AD-605 407 Div. 1, 9, 22
OTS Prices: HC $8.30/MF $2.25

Aircraft Armaments, Inc., Cockeysville, Md.
A PROGRAM TO INDUCE HIGH BLAST-INDUCED AIRLOADS AND STRUCTURAL RESPONSE OF LIFTING SURFACES,
by R. L. Jarvis, J. J. Kaspar, R. R. Mills, and I. O. Wolf. Jul 64, 527p
Contract AF33 616 7099, Proj. 1350, Task 135002
ASD TDR63 764, V2

Unclassified report

See also AD-436 114.

Descriptors: (*Airfoils, Shock waves), (*Wings, Aerodynamic loading), Swept wings, Airplane models, Shock tubes, Lift, Blast, Angle of attack.

A mathematical model is formulated for the ship Fresnel lens optical landing system/(FLOLS)/pilot/aircraft system, considering deck motions and air turbulence inputs. Performance of this model in terms of terminal conditions in the vertical plane (ramp clearance, impact velocity, dispersion of the touchdown point) and aircraft longitudinal motions in the groove prior to touchdown is consistent with and validated by actual performance. The terminal dispersions are statistically combined to yield probabilities of potential ramp strikes, landing gear failures, and bolters, which, when put through a simplified pilot/LSO decision model, yield probabilities of successful pass, bolter rate, and accident rate. Again, these rates are consistent with actual experience and are used as criteria for evaluating various competing systems. The effects on landing performance of variations in piloting technique, FLOLS stabilization methods, intensity and spectral form of ship motions, and gust inputs are computed. The variations tested and their resulting relative performance are described. Tentative conclusions are drawn from the analysis relating to possible improvements to the present operational recovery system. (Author)

AD-605 844 Div. 1, 26, 27
OTS Prices: HC $5.00/MF $1.00

Vertol Div., Boeing Co., Morton, Pa.
INVESTIGATION OF THE CONFORMAL GEAR FOR HELICOPTER POWER TRANSMISSION,
by J. Mack. Jun 64, 152p VAC R-345
Contract DA44 177AMC101T Proj. 1D121401A14414
TRECOM TR64 28

Unclassified report

Descriptors: (*Transmission gears, Helicopters), (*Reduction gears, Helicopters), (*Helicopters, Gears), Vertical take-off planes, Power, Transmissions, Models (Simulations), Design, Performance (Engineering), Test methods, Photoelasticity.

This report covers Phase I of a study of conformal contact gearing to determine its applicability to current or projected Army aircraft. The work includes: (1) An analytical investigation of the conformal tooth bending and contact stresses; and (2) A design investigation, using the analytical method to illustrate the advantages and problems of the conformal tooth transmission for various ratios and horsepower inputs. Some results of an independent photoelastic stress investigation conducted by Vertol are also included. (Author)

AD-605 893 Div. 1, 23, 24, 28, 30
OTS Prices: HC $3.00/MF $0.75

Human Factors Research, Inc., Los Angeles, Calif.
GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: A RESEARCH METHOD,
by James J. McGrath and Gail J. Borden.
Sep 64, 82p Human-TR-751-2
Contract Nonr4218 00

Unclassified report

Also sponsored by: Bureau of Naval Weapons, Washington, D. C. Army Electronics Research and Development Activity, White Sands Missile Range, N. Mex.

Descriptors: (*Performance (Human), Pilots), (*Pilots, Navigation), (*Flight simulators, Motion picture photography), Performance (Human), Visual signals, Motion picture cameras, Flight paths, Low-altitude, Air force personnel, Naval personnel, Performance tests, Analysis of variance, Human engineering, Aviation accidents, Laboratory equipment.

A methodological experiment was conducted using 24 pilots as experimental subjects. After a briefing, a chart study period, and a practice run, the subject attempted to maintain geographic orientation while sitting in the cockpit viewing one of the motion pictures. The experimental task required the subject to draw his ground track on an aeronautical chart, and upon periodic demand to indicate his exact navigational position. Each subject performed the task twice, a different flight route being used each time. The subjects were divided into three groups of eight. One group was given no navigational information other than the visual cues in the motion picture scene; the second group was given speed and elapsed time information; and the third group was given speed, time, and heading information to supplement the visual information. The results showed that individual differences in orientation performance were very large and performance scores were markedly skewed. There were no statistically significant differences between the performances of the three groups of subjects; there was no significant difference between performances on the two different routes, and no evidence of a practice effect.

AD-605 947 Div. 1, 5, 25
OTS Prices: HC $4.00/MF $0.75

Dynasciences Corp., Fort Washington, Pa.
INVESTIGATION OF AN ELECTROMAGNETIC INTERFERENCE-FREE ACTIVE STATIC DISCHARGING TECHNIQUE FOR FIXED AND ROTARY WING AIRCRAFT.
Final rept. for May-Dec 63,
by Juan de la Cierva, David L. Heller, and Paul B. Wilson, Jr. Aug 64, 116p DCR-131
Contract AF33 657 11597
AL TDR64 35

Unclassified report

Descriptors: (*Aircraft, Electrostatics), (*Radiofrequency interference, Aircraft), (*Electrostatics, Aircraft), Electric discharges, Noise (Radio), Helicopters, Airplanes, Voltage, Radio communication systems, Control panels, Servomechanisms, Capacitance, Wind tunnel models, Equations, Rotary wings.

An active electrostatic discharger was designed and constructed for the elimination of electrostatic charges from aircraft. This discharger maintains the charge potential of any type of aircraft at a very low level. The radio frequency interference generated by the corona discharge through the active discharger is very much lower than the interference generated by discharge from an aircraft equipped with passive dischargers. Corona discharge probes for use with active electrostatic dischargers were studied with regard to their current and R. F. interference characteristics. Characteristics of numerous probe designs were evaluated through wind tunnel tests. A reduction of 40 to 60 db. dependent upon frequence and conditions in the RFI noise due to static charge buildup in helicopters can be anticipated by using active discharging techniques. (Author)

AD-605 978 Div. 1, 9
OTS Prices: HC $4.00/MF $1.00

Institute of Tech., Univ. of Minnesota, Minneapolis.
THEORETICAL PARACHUTE INVESTIGATIONS.
Progress rept. no. 16, 1 Dec 60-28 Feb 61,
by H. G. Heinrich, T. Riabokin, S. K. Ibrahim, E. L. Haak, and R. J. Niccum. 28 Feb 61, 138p
Contract AF33 616 6372

Unclassified report

Descriptors: (*Parachutes, Aerodynamic characteristics), Wake, Drag parachutes, Towed bodies, Wind tunnel models, Porosity, Cargo parachutes, Supersonic flow, Ribbon parachutes.

Contents: Investigations of wake effects on the behavior of parachutes and other retardation devices behind large bodies at subsonic and supersonic speeds; Investigation of basic stability parameters of conventional parachutes; Theoretical study of supersonic parachute phenomena; Theoretical analysis of the dynamics of the opening parachute; Study of basic principles of new parachutes and retardation devices.

AD-606 040 Div. 1, 19, 31
OTS Prices: HC $4.00/MF $1.00

Systems Technology, Inc., Inglewood, Calif.
AN ANALYSIS OF TERMINAL FLIGHT PATH CONTROL IN CARRIER LANDING,
by Tulvio S. Durand and Gary L. Teper. Aug 64, 138p STI-TR-137-1
Contract Nonr4156 00

Unclassified report

Descriptors: (*Carrier landings, Landing aids), (*Landing aids, Carrier landings), Flight paths, Glide path systems, Instrument landings, Optical instruments, Mathematical models, Terminal flight facilities, Naval aviation, Aviation safety.

obtained concerning the various phases of the study. With this information available, a preliminary laboratory study was carried out to compare the results with the various authors' findings and to check the applicability of the existing proposed methods for predicting the sediment transport due to wave action.

AD-605 161 Div. 2, 25
OTS Prices: HC $3.00/MF $0.75

New York Univ., N. Y. Coll. of Engineering.
OPTICAL SOUNDING. EXPERIMENT AND INSTRUMENTATION DESIGN CONSIDERATIONS.
Technical rept. no. 3, 1 Jul-30 Sep 62,
by R. M. Schotland, A. M. Nathan, E. A. Chermack,

10cE. E. Uthe, and D. Chang. 30 Sep 62, 86p
Contract DA36 039sc87299, Proj. 3A99 07 001
Unclassified report

Descriptors: (*Atmospheric sounding, Optical analysis), (*Optical phenomena, Atmospheric sounding), Meteorology, Water vapor, Absorption, Infrared radiation, Monochromatic light, Lasers, Atmospheric temperature, Doppler effect, Scattering, Carbon dioxide, Optical scanning, Remote control systems, Optical instruments, Design.

Experiments have been designed to test concepts for the remote sounding of the atmosphere by optical methods. In the first section an experiment is designed to measure the vertical profile of water vapor. This method is based on the differential absorption of infrared energy scattered from a searchlight beam. An analysis is presented of a Doppler method for the determination of the temperature distribution in an arbitrary direction. This method is based upon the Doppler shift that occurs when monochromatic energy is scattered by air molecules under thermally induced motion. A passive experimental technique for the determination of atmospheric temperature profiles has been analyzed. This method makes use of the variation of irradiance from a portion of the 4.3 micron CO2 band as seen by a detector scanning in elevation. (Author)

AD-605 175 Div. 2, 10
OTS Prices: HC $1.00/MF $0.50

Atlantic Research Corp., Alexandria, Va.
STUDY OF ELECTRON GENERATION BY SOLID PROPELLANT TECHNIQUE,
by R. Friedman, L. W. Fagg, T. K. Millar, W. D. Charles, and M. C. Hughes. 21 Sep 62, 22p
Contracts AF49 638 651 and AF19 628 295
N63 17430
Unclassified report

Descriptors: (*Electrons, Generators), (*Solid rocket propellants, Electrons), (*Ionospheric propagation, Test facilities), Cesium compounds, Nitrates, Aluminum, Combustion products, Thermodynamics, Rocket motor nozzles, Spectroscopy.

Electron generators functioning by combustion of a cesium nitrate-aluminum pressed charge have been developed and test-fired in an altitude chamber. Thermodynamic analysis of the combustion and nozzle-expansion process shows that about 10 to the 20th power electrons are discharged per gram of charge, the gaseous product containing about 2 mole per cent electrons. Spectroscopic measurements of the exhaust plume at 40 mm Hg abs confirm electron concentrations of this magnitude via Stark-broadening of cesium emission lines. Details of generator operation are given, and alternate chemical systems for electron generation are discussed. (Author)

AD-605 196 Div. 2
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
HORIZONTAL AND VERTICAL DISTRIBUTIONS OF ATMOSPHERIC DENSITY, UP TO 90 KM.
Air Force Surveys in Geophysics,
by Allen E. Cole and Arthur J. Kantor. Jun 64, 42p
Proj. 8624, Task 862401
AFCRL 64 483; AFCRL afsg157
Unclassified report

Descriptors: (*Atmosphere, Density), Physical properties, Distribution, Periodic variations, Measurement, Geophysics, Meteorology.

Estimates of seasonal, latitudinal, day-to-day and diurnal variations in the horizontal and vertical distribution of atmospheric density are provided for altitudes up to 90 km. The rates of decay of inter-level correlations with layer separation for the region 48 to 70 km are compared to those computed for levels between 12 and 26 km. The day-to-day variability in height of constant density surfaces is also examined with special emphasis on levels near 8 km, approximate location of the well-known isopycnic level. (Author)

AD-605 230 Div. 2
OTS Prices: HC $1.00/MF $0.50

Owens Valley Radio Observatory, Calif. Inst. of Tech., Pasadena.
COMPONENT SHAPES IN DOUBLE RADIO SOURCES,
by Alan T. Moffet. 1964, 5p
Unclassified report

Observations of the Owens Valley Radio Observatory.

Descriptors: (*Radio astronomy, Galaxies), (*Extraterrestrial radio waves, Sources), Stars, Configuration, Optical properties, Astrophysics.

AD-605 268 Div. 2, 9
OTS Prices: HC $1.00/MF $0.50

Pennsylvania State Univ., University Park Mineral Industries Experiment Station.
CHANGE OF TERRAIN ROUGHNESS AND THE WIND PROFILE.
Scientific rept. no. 3,
by H. A. Panofsky and A. A. Townsend. 30 Apr 64, 12p
Contract AF19 604 6641, Proj. 8604, Task 860401
AFCRL 64 402
Unclassified report

Pub. in the Quarterly Journal of the Royal Meteorological Society 1964, Apr, v. 90, no. 384, p. 147-155.

Descriptors: (*Wind, Terrain), (*Terrain, Atmospheric motion), Theory, Surface properties, Turbulent boundary layer.

A theory is constructed to describe the distribution of wind with height in hydrostatically neutral air following a sudden change in terrain roughness. The agreement with measurements made at a variety of locations is satisfactory. (Author)

AD-605 272 Div. 2, 30
OTS Prices: HC $6.00/MF $1.25

Texas Instruments, Inc., Dallas.

2. Astronomy, Geophysics and Geography

AD-605 152 Div. 2, 33
OTS Prices: HC $2.00/MF $0.50

Travelers Research Center, Inc., Hartford, Conn.
SCALE ANALYSIS OF TERMINAL WEATHER VARIATIONS.
Summary status rept., part A, 1 Jul 63-30 Jun 64,
by K. D. Hage. 30 Jun 64, 38p TRC-7412-128-A
Contract Cwb10704

Unclassified report

Descriptors: (*Airports, Meteorological parameters), (*Meteorological parameters, Airports), Visibility, Rain, Fog, Wave transmission, Scale, Analysis.

The objective of the investigations was to determine the characteristic variability of weather elements (of concern to aviation operations) and to identify the characteristic lifetimes and space scales of the weather processes involved in short-period forecasting. The studies were concerned almost exclusively with variations in atmospheric transmission as recorded by more-or-less conventional instruments installed in the vicinity of airfield runways. The principle sources of data were the multiple installations at the Federal Aviation Agency National Aviation Facilities Experimental Center (NAFEC) and the John F. Kennedy International Airport in New York City. (Author)

AD-605 153 Div. 2, 33
OTS Prices: HC $3.00/MF $0.75

Travelers Research Center, Inc., Hartford, Conn.
PREDICTION TECHNIQUE DEVELOPMENT.
Summary status rept., part B, 1 Jul 63-30 Jun 64,
by H. D. Entrekin. 30 Jun 64, 64p TRC-7412-128-B
Contract Cwb10704

Unclassified report

Descriptors: (*Airports, Weather forecasting), (*Weather forecasting, Airports), Meteorological parameters, Clouds, Fog, Atmospheric precipitation, Wind, Barometric pressure, Wave transmission, Scale, Air mass analysis.

During the months of January, February and March of 1964, continuous observations of wind and transmission were collected from DCA mesonetwork stations for five data periods characterized by low cloud, fog, and precipitation. These data were further supplemented by mesonet pressure observations at half-hourly intervals, hourly observations of weather from United States Weather Bureau stations and by facsimile surface charts. Continuous observations of temperature and dewpoint temperature were also available from several mesonet stations for one episode. These data provide the first opportunity to study the space scale and movement of transmission fields for station spacing of 0.8-76.0 miles. (Author)

AD-605 154 Div. 2, 33
OTS Prices: HC $1.00/MF $0.50

Travelers Research Center, Inc., Hartford, Conn.
RADAR APPLICATIONS IN TERMINAL AND ENROUTE WEATHER FORECASTING.
Summary status rept., part C, 1 Jul 63-30 Jun 64,
by J. W. Wilson. 30 Jun 64, 10p TRC-7412-128-C
Contract Cwb10704

Unclassified report

See also AD-605 153.

Descriptors: (*Meteorological radar, Data processing systems), (*Airport radar systems, Meteorological radar), (*Weather forecasting, Meteorological radar), Radar signals, Statistical analysis, Programming (Computers), Air traffic control systems.

The purpose of the task was to develop objective techniques for interpreting and processing weather radar data for integration with other meteorological observations into a national aviation weather system. Work was confined to three areas: (a) incorporation of a routine into the Statistical Properties Program for computing the average length and width of weather echoes; (b) determination of relationships between statistical properties of the echo patterns and predictability of the patterns; (c) determination of echo movements and predictability of features in the echo patterns as a function of their space scales.

AD-605 155 Div. 2
OTS Prices: HC $1.00/MF $0.50

Travelers Research Center, Inc., Hartford, Conn.
SYNOPTIC STUDY OF PREDICTIONS OF CLOUD COVERAGE AND NORMALIZED CLOUD HEIGHT.
Technical memo no. 3,
by Marshall A. Atwater. 2 Dec 63, 20p TRC-7413-108
Contract Cwb10704

Unclassified report

Descriptors: (*Weather forecasting, Errors), (*Cloud cover, Mathematical prediction), (*Clouds, Height finding), Air mass analysis, Terrain, Atmospheric motion, Wind, Cloud height indicators.

Cases in which large errors occurred in the prediction of cloud amount and normalized cloud height were analyzed. The biggest errors occurred with the westward movement of fronts. Other errors occurred when fronts (moving west to east) passed the predictand point. Local conditions and advection of air over elevated terrain also were reasons for many errors. Parameters that may be helpful in screening runs would be upslope motion, and possibly upper air winds to be used for steering and speed of movement of surface features. Possible prediction points should be located east and south of the point for advection in the eastern U. S. Additional frontal parameters may be included to minimize the errors caused by fronts. (Author)

AD-605 158 Div. 2
OTS Prices: HC $3.00/MF $0.75

Hydraulic Engineering Lab., Univ. of Calif., Berkeley.
SEDIMENT TRANSPORT BY WAVES AND CURRENTS.
Progress rept.,
by M. M. Abou-Seida. May 64, 76p HEL-2-7
Contract DA49 055CIV Eng63 4

Unclassified report

Descriptors: (*Water waves, Transport properties), (*Ocean currents, Transport properties), (*Beaches, Hydrology), Sedimentation, Sand, Boundary layer, Turbulence, Oscillation, Test methods, Reviews.

The first phase of the investigation was a library study of the work done pertaining to the phenomenon of the sand movement due to wave action. This survey provided information on the various techniques and procedures used; it also provided information about the different results

satellite and missile data, arctic and antarctic communications; and meteorology of the upper atmosphere.

AD-605 359 Div. 2, 15
OTS Prices: HC $2.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
ON THE ACCURACY OF THE COEFFICIENTS IN A SERIES OF SPHERICAL HARMONICS.
Scientific rept. no. 7-1,
by G. L. Strang van Hees. Apr 64, 28p IGPC-40
Contract AF19 628 2771, Projs. 7600, 1613, Task 76002
AFCRL 64 573

Unclassified report

Descriptors: (*Geodesics, Terrain), (*Special functions, Geodesics), Integration, Errors, Spheres, Gravity, Series.

The accuracy of the coefficients of a development in a series of spherical harmonics is investigated. Usually the coefficients are determined by numerical integration. Therefore, the surface of the sphere is divided into small surface elements and the mean value of the function for each surface element is estimated. Two sources of error are distinguished: (1) Representation error. This is the error of the estimation of the mean value of the function for each surface element. (2) Integration error. This is the error caused by the replacement of the integral by a numerical integration. Both errors are separately investigated. (Author)

AD-605 360 Div. 2
OTS Prices: HC $2.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
ON FREE AIR ANOMALIES ESTIMATED FROM DIFFERENT MODELS.
Scientific Rept. no. 8,
by Erwin Groten. May 64, 26p IGPC-42
Contract AF19 628 2771, Proj. 7600, 1613, Task 760002
AFCRL 64 574

Unclassified report

Descriptors: (*Geodesics, Gravity), (*Gravity, Mathematical models), Northern hemisphere, Terrain, Isostatic change, Harmonic analysis, Equations, Earth, Geodesics, Geophysics, Terrain, Surveying.

From mean free air anomalies of 124 5 degrees x 5 degrees squares as observed on the northern hemisphere, the accuracy of model anomalies for different models is tested. Only mean elevations are used in the evaluation of topographic effects. (Author)

AD-605 384 Div. 2
OTS Prices: HC $3.00/MF $0.75

Texas A. and M. Univ., College Station.
ANALYSIS OF THE SALINITY REGIME OF THE MISSISSIPPI RIVER GULF OUTLET CHANNEL,
by David E. Amstutz. Aug 64, 82p TAMU Ref-64-21T
Contract Nonr2119; Grant NSF G19780, Projs. NR083 036, 299

Unclassified report

Descriptors: (*Salinity, Inland waterways), (*Rivers, Salinity), Gulfs, Louisiana, Lakes, Water, Least squares method, Polynomials, Meteorological parameters, Tides, Correlation techniques, Mathematical prediction, Industries, Marine engineering, Mississippi.

A least squares regression analysis of the spatial distribution of salinity in a vertical section along the major axis of the Mississippi River - Gulf Outlet Channel is carried out, employing a two-dimensional orthogonal polynomial regression relation to represent the spatial structure. The spatial structures investigated were observed monthly, during both high and low tide conditions, over a period of 13 months. The 10 polynomial coefficients, constituting the third degree regression relations for each of these structures, are analyzed for correlation with various salinity regime influencing phenomena. Sufficient relationships were observed to enable a linear forecast of the channel salinity structure, using the factors of tidal range and lake delivery. (Author)

AD-605 385 Div. 2
OTS Prices: HC $3.00/MF $0.75

Texas A. and M. Univ., College Station.
METEOROLOGICAL SATELLITE PHOTOGRAPHS AS INDICATORS OF CYCLOGENESIS AND THE RELATED CLOUD DISTRIBUTION AND STRUCTURE OVER THE GULF OF MEXICO: A CASE STUDY.
Master's thesis,
by Malcolm E. Gosdin. Aug 64, 68p
Proj. 349

Unclassified report

Sponsored in part by the U. S. Weather Bureau.

Descriptors: (*Meteorological satellites, Photographs), (*Weather forecasting, Meteorological satellites), (*Cloud cover, Mexico gulf), Marine meteorology, Air mass analysis, Cyclones, Clouds, Meteorological parameters, Photographic analysis.

Two satellite pictures, taken approximately 24 hours apart, revealed the intensification of this wave system and its associated cloud masses as it moved northward from its breeding grounds to the Texas-Louisiana coast. Lack of surface synoptic reports in the Gulf of Mexico precluded accurate location of the wave and associated fronts, but fairly accurate positions were interpreted from the cloud patterns in the TIROS photographs. These interpretations were based on the Boucher-Newcomb frontal wave model. Included in this study are a brief synoptic history of the storm, a descriptive and subjective interpretation of the cloud images and a discussion of the apparent relation between the cloud patterns and the conventional analysis. In spite of the subjectivity of the cloud interpretation, this study suggests that TIROS observations provide a basis for logical meteorological analysis in areas where conventional data are sparse or non-existent. (Author)

AD-605 405 Div. 2
OTS Prices: HC $4.00/MF $0.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TRANSACTIONS OF THE MAIN GEOPHYSICAL OBSERVATORY, 1963, NO. 146(208)
4 Sep 64, 115p
FTD MT64 124; TT 64 71306

Unclassified report

Trans. of Glavnaya Geofizicheskaya Observatoriya, Leningrad. Trudy (USSR) 1963, no. 146(208) p. 1-75.

Descriptors: (*Atmospheric electricity, Measurement), (*Thunderstorms, Atmospherics), Lightning, Troposphere, Electrostatics, Drops, Fog, Geophysics, USSR.

The collection is devoted to questions of investigating atmospherics being generated in nearby thunderstorms,

WORLDWIDE COLLECTION AND EVALUATION OF EARTHQUAKE DATA. FINAL REPORT ON EVALUATION OF 1960 SEISMICITY.
Special repts. no. 3,
by R. L. Fisher, R. G. Baker, and R. R. Guidroz.
Jun 64, 256p
Contract AF19 604 8517, Proj. 8652
AFCRL 64 520

Unclassified report

Rept. on Proj. Vela Uniform, see also AD-402 640.

Descriptors: (*Seismology, Earthquakes), (*Earthquakes, Intensity), Seismic waves, Seismological stations, Global communication systems, Seismographs, Geophysics, Data, Analysis.

Objectives of the study were: Evaluation of worldwide seismicity in 1960 and comparison with that of other years; quantitative comparison of seismic activity in various regions of the world; definition of areas of unusual activity; investigation of the relation between magnitude and earthquake recurrence frequency at a few selected locations; and presentation of a far greater number of magnitude calculations than were available previously for use in capability assessments and in seismicity evaluation. To provide a comprehensive view of seismic activity, several presentation methods are used. Among them are seismicity and epicentral maps, which permit both a region-to-region comparison of activity and a comparison of the 1960 activity with the average annual seismicity. In this study, emphasis was placed on earthquakes in the magnitude range 5.0 to 6.0 (Richter scale) because capabilities of the seismograph stations furnishing data were sufficient for recording all shocks of magnitude 5.0 or greater. Also many shocks of magnitude 3.0 to 5.0 were recorded, and results are given for these events.

AD-605 273 Div. 2, 30
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
FALLING SPHERE MEASUREMENTS OF ATMOSPHERIC DENSITY, TEMPERATURE, AND PRESSURE, UP TO 115 km.
Environmental research papers,
by K. S. W. Champion and A. C. Faire. Jul 64, 44p
Proj. 6690
AFCRL 64 554; AFCRL ERP34

Unclassified report

Paper presented at the International Space Sciences Symposium (5th), (COSPAR) in Florence, Italy, May 1964.

Descriptors: (*Atmosphere, Density), (*Meteorological instruments, Falling bodies), (*Falling bodies, Meteorological instruments), Spheres, Accelerometers, Telemeter systems, Measurement, Atmospheric temperature, Barometric pressure.

Newly developed airborne instrumentation has made it possible to extend the measurements of atmospheric density, temperature and pressure from the previous upper limit of 90 km to 115 km by means of the 7-inch rigid sphere method. A brief description of the instrumentation is given. Results of four rocket-borne experiments launched at White Sands Missile Range, New Mexico, in November 1963 and February 1964 are presented and compared with the U. S. Standard Atmosphere, 1962, and a winter atmosphere for 30 degrees latitude. (Author)

AD-605 274 Div. 2, 12
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
GEODETIC POSITIONING FROM SIMULTANEOUS OPTICAL OBSERVATIONS OF THE ANNA I-B SATELLITE.
Environmental research papers,
by Lyndon L. Sheldon and Donald H. Eckhardt.
Jul 64, 26p
Proj. 7600
AFCRL 64 562, AFCRL ERP35

Unclassified report

Descriptors: (*Geodesics, Satellites (Artificial)), (*Satellites (Artificial), Geodesics), Position finding, Navigation satellites, Beacon lights, Astronomical cameras, Photographs, Azimuth, Determination, Least squares method.

Simultaneous photographic observations of flashes from the ANNA I-B geodetic satellite were made by Air Force PC-1000 cameras during the period September 1963 to January 1964. Geodetic position determinations using these ANNA observations indicate that the PC-1000 camera system used with the intervisible technique is capable of extending geodetic control to a proportional accuracy of better than 1/100,000. (Author)

AD-605 320 Div. 2
OTS Prices: HC $3.00/MF $0.75

Woods Hole Oceanographic Institution, Mass.
THE NORMAL DYNAMIC TOPOGRAPHY OF THE LABRADOR CURRENT AND ITS ENVIRONS IN THE VICINITY OF THE GRAND BANKS OF NEWFOUNDLAND DURING THE ICEBERG SEASON,
by Floyd M. Soule. 1964 52p WHOI-Ref-64-36
Contract TCG01327A

Unclassified report

Descriptors: (*Ocean currents, Surface properties), Maps, Newfoundland (Province), Oceanology, Temperature, Salinity, Dynamics.

A series of surface and subsurface observations of temperature and salinity was made for the waters over the northeastern, eastern and southern slopes of the Grand Banks and the contiguous area seaward. The data was collected by the International Ice Patrol from 1913 to the present.

AD-605 327 Div. 2
OTS Prices: HC $2.00/MF $0.50

Aerospace Technology Div., Library of Congress, Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE: COMPILATION OF ABSTRACTS.
Rept no. 48 on Reviewing Soviet Developments in Selected Problems in Astrophysics and Geophysics.
2 Sep 64, 32p
ATD P64 51; TT 64 71300

Unclassified report

Surveys of Soviet-Bloc Scientific and Technical Literature. Rept. based on materials received at Aerospace Tech. Div. in May 64.

Descriptors: (*Upper atmosphere, Abstracts), (*Abstracts, Upper atmosphere), Ionosphere, Electron density, Solar radiation, Van Allen radiation belt, Cosmic rays, Atmospheric electricity, Satellites (Artificial), Communication systems, Polar regions, Meteorology, Astrophysics, Geophysics, USSR.

Topics covered in this series are as follows: Ionospheric electron concentrations, solar radiation and the ionosphere, Van Allen belts and cosmic rays, telluric currents, atmospheric electricity, nuclear bursts in the atmosphere,

THE ENERGY BUDGET AT THE EARTH'S SURFACE, PART II,
Production research rept.,
by Edgar R. Lemon. Sep 63, 54p
Proj. 3A99 27 005
USDA PRR72

Unclassified report

Descriptors: (*Turbulent boundary layer, Terrain), (*Mathematical models, Micrometeorology), (*Terrain, Turbulent boundary layer), (*Micrometeorology, Turbulent boundary layer), Turbulences, Fluid dynamic properties, Theory, Experimental data, Wind, Atmospheric motion, Carbon dioxide, Convection, Energy, Surface properties, Earth, Photosynthesis, Heat transfer, Plants (Botony).

This report presents in part the results of research conducted with the particular objective of evaluating the aerodynamic surface roughness and relating it to the elastic and geometric characteristics of the surface cover. Theoretical and experimental investigations of the turbulent transfer characteristics of the air-stream near the ground are reported. It is shown that the surface boundary layer must be divided into two regions: the freestream above the surface where the various forms of turbulent transfer are nearly independent of height, and the airstream within the vegetative canopy where sources and sinks are present. Several theoretical models for canopy flow are reported and compared with observations. A numerical method for determining the aerodynamic characteristics and their standard errors in the freestream is described. Experimental results for freestream and canopy flow are reported. It is concluded that canopy flow is fully turbulent and that the observations satisfy best a theoretical model in which the mixing length is a function of height above the ground surface. Experimental data show that the aerodynamic surface roughness varies with the windspeed and the variations depend upon the geometric and elastic characteristics of the vegatation. (Author)

AD-605 538 Div. 2, 12, 19
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
LONG LINE AZIMUTHS FROM OPTICAL OBSERVATIONS OF THE ANNA FLASHING SATELLITE.
Environmental research paper,
by Armando Mancini. Jun 64, 26p
Proj. 7600, Task 760006
AFCRL 64 446; AFCRL ERP21

Unclassified report

Descriptors: (*Navigation satellites, Direction finding), (*Geodesics, Satellites (Artificial)), (*Satellites (Artificial), Geodesics), Astronomical cameras, Beacon lights, Optical scanning, Azimuth, Determination.

Geodetic azimuths of lines ranging from 300 km to 1400 km have been determined from simultaneous optical observations of the ANNA Flashing Satellite. The results of this test prove that the azimuth or the space direction between two stations can be achieved to an accuracy better than one second with only a limited amount of data. The reason for the high accuracy is attributed to two factors: (1) the metric accuracy of the PC-1000's stellar cameras, and (2) the 'perfect' simultaneity in the observations provided by the ANNA strobe light. (Author)

AD-605 546 Div. 2, 26
OTS Prices: HC $1.00/MF $0.50

Kaysam Corp. of America, Paterson, N. J.
PRODUCTION ENGINEERING MEASURE FOR MANUFACTURE OF METEOROLOGICAL BALLOONS TYPE ML-541 ( )UM.
Quarterly progress rept. no. 9, 19 Apr-18 Jul 64,
by Frank Sterne. 18 Jul 64, 12p
Contract DA36 039sc85988

Unclassified report

Descriptors: (*Meteorological balloons, Manufacturing methods), Production, Flight testing, Performance (Engineering), Design, Costs, Inflatable structures.

The prime technical objective of this production engineering measure is to establish the capability of producing the ML-541( )/UM balloon on a pilot-run basis. This objective implies the attainment of improved quality of balloon and the achievement of uniformity in the finished balloon and its performance in flight. A second objective is the development of manufacturing methods to a high level of technology. This provides for the utilization of automatic and semi-automatic equipment whenever possible, taking into consideration that the balloon is a delicate device to handle. A goal in the design of the equipment is to anticipate technological development of meteorological balloons, and to design all equipment in such a manner that the danger of early obsolescence is practically nil. A further objective is to prepare a mobilization plan for production of the ML-541( )/UM balloon at the specified production rate. From an economic point of view, the goal of the development of improved methods of manufacture under this production engineering measure is the reduction in cost and price of this balloon.

AD-605 551 Div. 2, 9, 15, 30
OTS Prices: HC $2.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
A THEORY OF RAYLEIGH WAVES BASED ON A VISCOELASTIC-PLASTIC MODEL OF EARTH'S CRUST AND MANTLE,
by Paul Lieber and K. T. Yen. Oct 63, 34p MD-63-4
Contract Nonr222 87

Unclassified report

Descriptors: (*Earth models, Viscoelasticity), (*Viscoelasticity, Earth models), (*Seismology, Mathematical analysis), Elasticity, Plasticity, Lithosphere, Differential equations, Geophysics.

The work reported here on Rayleigh Waves in a Maxwell Body is a segment of comprehensive investigation on relaxation phenomena and inelastic processes in the earth. The results of the theory presented on Rayleigh Waves in a Maxwell Body are embodied in equations which show that effects pertaining to period selectivity, attenuation and dispersion are obtained for a Maxwell Body which cannot, in principle, be accounted for by an elastic theory of Rayleigh Waves. Also it was found in the case of Love waves, that the effects of inelastic constitution in conjunction with layering should lead to significant, observable manifestations in seismic data, which in principle cannot be accounted for by an elastic theory.

AD-605 567 Div. 2, 20
OTS Prices: HC $6.00/MF $1.25

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PORTABLE NEUTRON GENERATORS IN NUCLEAR GEOPHYSICS (COLLECTION OF ARTICLES)
ed. by S. I. Savosina. 29 Jul 64, 253p
FTD MT63 283, TT 64 71328

Unclassified report

Edited machine trans. of mono. Portativnye Generatory Neitronov v Yadernoi Geofizike: Sbornik Statei (po Sovetskim i Zarubezhnym Pabotam) Moscow, 1962, p. 1-204.

of the theory and designing of detectors of lightning discharges, analysis of the operations of these detectors. In it are considered also certain regularities in the distribution of thunderstorms areally in the territory of Soviet Union and certain regularities of distribution of elements of atmospheric electricity over the globe. The collection of articles is intended for specialists in atmospheric electricity. (Author)

AD-605 416 Div. 2
OTS Prices: HC $5.00/MF $1.00

Howell (W. E.) Associates, Inc., Lexington, Mass.
A STUDY OF MIDDLE CLOUD WAVE PATTERNS.
Final rept.,
by Manuel E. Lopez and Sigurd N. Ronning. 31 May 64, 160p
Contract AF19 628 306, Proj. 6698, Task 669802
AFCRL 64 465

Unclassified report

Descriptors: (*Cloud cover, Configuration), (*Air mass analysis, Cloud cover), Meteorological satellites, Stereoscopic photography, Clouds, Distribution, Meteorological parameters, Weather forecasting, Statistical analysis, Catalogs.

The purpose of this report is to present a catalogue of middle-cloud wave patterns with the prevailing synoptic weather situation and the pertinent physical information about the atmosphere in the immediate vicinity of the clouds and to analyze these patterns to explore any possible relationship between them and the concommitant state of the atmosphere that may serve as clues to their origin and for useful utilization of satellite pictures.

AD-605 434 Div. 2
OTS Prices: HC $2.00/MF $0.50

Illinois Univ., Urbana.
ANALYSIS OF 440 mc RADIATION FROM THE SUN DURING THE ECLIPSE OF JULY 20, 1963.
Master's thesis,
by Hugh Wilson Richardson. 1964, 50p

Unclassified report

Descriptors: (*Solar radiation, Radio astronomy), (*Extraterrestrial radio waves, Solar radiation), Astrophysics, Solar atmosphere, Ultrahigh frequency, Temperature, Analysis, Brightness, Solar eclipses.

The sun at 440 mc on July 20, 1963 appeared as a disk of radius 1.1 times the optical radius of the sun. This value was somewhat lower than values obtained by observers on previous dates. However, July 20, 1963 was in a period of sunspot minimum, thus making the radius of 1.1 times optical size a realizable value. A radio plage on the eastern limb of the sun was detected from the radiation curve obtained during the first half of the eclipse. There were variations during the last half on the eclipse, but experimental error in the equipment resulted in poor data for that period; therefore, no conclusions were made concerning the latter half of the eclipse. The temperature measurement of the sun at 440 mc indicated a temperature of about 800,000K, which was of the magnitude predicted. (Author)

AD-605 462 Div. 2
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVESTIGATION INTO THE APPLICABILITY OF THE NORMAL LAW OF DISTRIBUTIONS OF RANDOM QUANTITIES FOR THE DERIVATION OF WIND-REGIME CHARACTERISTICS IN THE FREE ATMOSPHERE,
by S. V. Solonin and Yu. M. Liberman. 4 Aug 64, 18p
FTD TT64 357; TT 64 71311

Unclassified report

Unedited rough draft trans. of Problemy Fitziki Atmosfery (USSR) 1963, v. 1, p. 60-70.

Descriptors: (*Atmospheric motion, Climatology), (*Wind Atmospheric sounding), (*Distribution theory, Meteorology), Meteorological phenomena, USSR, Statistical distributions, Probability, Vector analysis, Atmosphere.

This article presents the results of the evaluation and analysis of materials from radiosonde observations in the districts of Moscow and Sverdlovsk in order to gather information as to the possibility of employing the normal law of random-quantity distribution for the derivation of climatic characteristics with respect to wind in the free atmosphere. Topics covered include (a) Normal law of wind-vector distribution. Method of calculating theoretical recurrence, and (b) Some results in checking the feasibility of the normal law or random-quantity distribution on the basis of wind sounding data.

AD-605 473 Div. 2, 12
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
FOR SPACE 'GARDENS'
by K. Barykin. 5 Aug 64, 5p
FTD TT64 734; TT 64 71321

Unclassified report

Unedited rough draft trans. from Trud, Moscow (USSR) 1964, no. 132, 6 Jun, p. 1.

Descriptors: (*Plants (Botony), Extraterrestrial bases), Mica, Minerals, Geology, USSR.

AD-605 513 Div. 2, 12, 16, 30
OTS Prices: HC $6.00/MF $1.25

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COSMIC RESEARCH, 1964, VOL. 2, NO. 4.
1' Sep 64, 254p
FTD TT64 892; TT 64 71325

Unclassified report

Unedited rough draft trans. of Kosmicheskie Issledovaniya (USSR) 1963, v. 2, no. 4, p. 507-654, See also AD-603 012.

Descriptors: (*Space environmental conditions, Scientific research), (*Satellites (Artificial), Astronautics), (*Space biology, Scientific research), Astrophysics, Atmosphere entry, Orbital trajectories, Celestial mechanics, Plastics, Combustion, Gas analysis, Magnetic storm, Atmosphere, Optical properties, Radiation effects, Photoelectric cells (Semiconductor), Geophysics, USSR.

Collection of Soviet reports dealing with space environmental conditions, space biology, astronautics, and physics of the upper atmosphere.

AD-605 527 Div. 2, 9, 15
OTS Prices: HC $3.00/MF $0.50

Agricultural Research Service, Cornell Univ., Ithaca, N. Y.

Descriptors: (*Gravity, Experimental data), (*Scientific satellites, Geodesics), Celestial mechanics, Orbital trajectories, Harmonic analysis, Satellite networks, Boundary value problems, Scale, Feasibility studies, Reviews.

The summary deals with the following individual papers and is updated, since they were written a year ago: (1) Methods of Physical Geodesy, (2) A Review on Close Satellite Geodesy, (3) The Geodetic Applications of Satellites, (4) Satellite Perturbations Due to Zonal Gravitational Harmonics, (5) On the Accuracy of Spherical Harmonics and Orbital Prediction. (Author)

AD-605 655 Div. 2, 12
OTS Prices: HC $2.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
METHODS OF PHYSICAL GEODESY.
Scientific rept. no. 5,
by W. A. Heiskanen and H. Moritz. Jun 64, 36p
IGPC-32
Contract AF19 628 1628, Proj. 7600, Task 760002
AFCRL 64 566 II

Unclassified report

Descriptors: (*Gravity, Measurement), (*Geodesics, Reviews), (*Scientific satellites, Geodesics), Astronomical geodesics, Algebraic topology, Satellites (Artificial), Perturbation theory, Geophysics, Terrestrial magnetism, Theory, Collecting methods, Standards.

A review is made of the progress of physical geodesy as of 1963. The gravimetric measurements and astrogeodetic methods, base lines, geopotential methods, the earth constants, flattening and the normal figure of the earth are discussed. (Author)

AD-605 656 Div. 2, 9, 12
OTS Prices: HC $3.00/MF $0.75

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
A REVIEW ON CLOSE SATELLITE THEORY.
Scientific rept. no. 2,
by Ivan I. Mueller. Jun 64, 90p IGPC-33
Contract AF19 628 1628, Proj. 7600, Task 760002
AFCRL 64 566 III

Unclassified report

Descriptors: (*Scientific satellites, Geodesics), (*Satellites (Artificial), Celestial mechanics), (*Orbital trajectories, Satellites (Artificial)), Orbital trajectories, Motion, Elipital orbit trajectories, Geometry, Transformations (Mathematics), Special functions (Mathematical), Atmospheric tides, Gravity, Drag, Solar wind, Terrestrial magnetism, Celestrial mechanics, Theory, Perturbation theory.

A review on close satellite theory is presented. A treatment is given on normal orbits in which case it is assumed that both the attracting and attracted masses are concentrated in points. Second, those factors are reviewed which deviate from these assumptions and their effect on the normal orbit. (Author)

AD-605 657 Div. 2, 12
OTS Prices: HC $3.00/MF $0.75

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
THE GEODETIC APPLICATIONS OF SATELLITES.
Scientific rept. no. 3,
by Ivan I. Mueller. Jun 64, 74p IGPC-34
Contract AF19 628 1628, Proj. 7600, Task 760002
AFCRL 64 566 IV

Unclassified report

Descriptors: (*Scientific satellites, Geodesies), (*Geodesics, Satellites (Artificial)), (*Satellites (Artificial), Geodesics), Astronomical geodesics, Orbital trajectories, Celestial mechanics, Geometry, Special functions (Mathematical), Perturbation theory, Gravity.

This deals with the geodetic application of artificial satellites. In the geometric applications the determination of geocentric observing station coordinates is treated. In the dynamic applications the coefficients of the spherical harmonics explanation of the earth's gravity potential function are determined for the perturbation of the elements. From these coefficients the shape of the earth and other pertinent geodetic data may be determined. (Author)

AD-605 658 Div. 2, 12
OTS Prices: HC $3.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
SATELLITE PERTURBATIONS DUE TO ZONAL GRAVITATIONAL HARMONICS.
Scientific rept. no. 4,
by Richard H. Rapp. Jun 64, 56p IGPC-35
Contract AF19 628 1628, Proj. 7600, Task 76002
AFCRL 64 566 V

Unclassified report

Descriptors: (*Gravity, Satellites (Artificial)), (*Scientific satellites, Geodesics), Celestial mechanics, Orbital trajectories, Harmonic analysis, Perturbation theory.

Literal expressions for the first order pertubative effects on the orbital parameters of a satellite orbit due to zonal gravitational harmonics to the tenth degree were derived from the general equations of Kaula. Numerical values from these expressions were converted to their effect on the apparent night ascensions, apparent declinations and distance of the satellite. (Author)

AD-605 659 Div. 2, 12
OTS Prices: HC $1.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
ON THE ACCURACY OF SPHERICAL HARMONICS AND ORBITAL PREDICTIONS.
Scientific rept. no. 6,
by Helmut Moritz. Jun 64, 24p IGPC-36
Contract AF19 628 1628, Proj. 7600, Task 760002
AFCRL 64 566 VI

Unclassified report

Descriptors: (*Gravity, Satellites (Artificial)), (*Scientific satellites, Geodesics), Celestial mechanics, Orbital trajectories, Harmonic analysis, Space surveillance systems.

The needed formulas for the gravity potential are derived and the standard error of the obtained coefficients of spherical harmonics are handled. Satellite orbits are influenced by the irregularities of the earth's gravity field, which are usually expressed in terms of a develop-

Descriptors: (*Geophysics, Neutron beams), (*Neutron beams, Geophysics), Geophysical prospecting, Well logging, Petroleum, Isotopes, Portable, USSR.

In the collection are included works of Soviet and foreign authors devoted to the general principles of the design of neutron generators and conditions of their application, mainly in geophysics. Along with this, in the collection are presented original articles on the theory of the method of impulse neutron-neutron coring, and also works devoted to the results of practical application of generators for petroleum deposits of the USSR. In the collection are considered various types of accelerating tubes which generate neutrons, diagrams and design of portable borehole instruments with these tubes and prospects of the application of neutron generators for the obtaining of isotopes with short half-lives, activation analysis, in reator construction, biology, and in the mining industry and other areas of the national economy. (Author)

AD-605 571 Div. 2, 9, 25, 30
OTS Prices: HC $2.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
ON CONVECTION IN A VISCOELASTIC PLASTIC MODEL OF THE EARTH'S CRUST AND MANTLE,
by Paul Lieber and Shrikant Desai. May 64, 49p
AM-64-14 (1)
Contract Nonr222 87

Unclassified report

Descriptors: (*Earth models, Viscoelasticity), (*Viscoelasticity, Earth models), (*Seismology, Mathematical analysis), Hydrodynamics, Elasticity, Plasticity, Lithosphere, Thermodynamics, Equations, Geophysics.

The reconciliation of Rayleigh-Benard convection currents with the transmission of shear waves in the mantle imposes rather strong and thus useful restrictions on the rheological models which can accommodate both of them and thereby serves to guide in the selection of an appropriate visco-elastic material for modeling the mantle with respect to its mechanical behavior. Some definite results are established which bear on the selection of an appropriate yet simple rheological model of the mantle by posing the question of hydrodynamic stability with respect to two essentially different rheological models. These are the Maxwell and Sesawa-Voigt materials.

AD-605 580 Div. 2
OTS Prices: HC $7.00/MF $1.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE CAUCASUS,
by A. A. Zanina. 30 Jun 64, 334p
FTD MT63 336; TT 64 71329

Unclassified report

Kavkaz, edited machine trans. of Klimat SSSR, 1961, no. 2, 290p.

Descriptors: (*Mountains, Climatology), (*Climatology, USSR), Solar radiation, Thermal radiation, Atmospheric motion, Atmospheric temperature, Wind, Humidity, Clouds, Atmospheric precipitation, Snow, Fog, Storms, Terrain, Plants (Botany), Soils, Geography.

Consideration is given to the characteristics of main climate-forming factors (radiation conditions, circulation and surfaces), brief general characteristics of climate of the Caucasus and description of its separate elements (heat, wind conditions, humidity conditions, atmospheric phenomena), and also climatic regionalizing of territory of Caucasus and characteristics of climate of its separate regions. (Author)

AD-605 586 Div. 2, 12, 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
EXPLORATIONS OF OUTER SPACE AND UPPER LAYERS OF THE ATMOSPHERE,
by A. A. Blagonravov. 17 Apr 64, 19p
FTD MT63 345; TT 64 71332

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Vestnik, 1963, v. 33, no. 9, p. 9-16.

Descriptors: (*Space probes, USSR), Space environmental conditions, Radio astronomy, Upper atmosphere, Satellite (Artificial), Scientific satellites, Instrumentation, Atmospheric sounding, Sounding rockets, Cosmic rays, Meteors, Ionosphere, Exploration.

This is a report on USSR space research with scientific satellites, rocket probes, and radioastronomy. The report includes a discussion on intrumentation and findings of several types of research satellites. It discusses the findings of a series of explorer rockets probes and radiolocation of the planets Mercury, Venus and Mars.

AD-605 629 Div. 2, 12
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Service, Ottawa (Canada).
STUDY OF THE SOLAR CORPUSCULAR RADIATION BY MEANS OF ARTIFICIAL SATELLITES,
by V. I. Krasovskii, Yu. M. Kushnir, and G. A. Bordovskii.
Jun 58, 14p NRC-C-2746
DSIS T298R; TT 64 71370

Unclassified report

Trans. of Uspekhi Fizicheskikh Nauk (USSR) 1958, v. 64, no. 3, p. 425-434.

Descriptors: (*Solar radiation, Measurement), (*Satellites (Artificial), Solar radiation), (*Scientific satellites, Solar radiation), Solar disturbances, Aurorae, Atmosphere, Ionospheric disturbances, Electron density, Terrestrial magnetism, Space environmental conditions, Spectrum analyzers, Ionization, Theory, Background, Astrophysics, USSR.

The use of artificial earth-satellites in solar corpuscular radiation research is presented. The historical development of theory concerning corpuscular emission of the sun and its effect on the upper atmosphere of the earth is discussed.

AD-605 654 Div. 2, 12
OTS Prices: HC $2.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
RESEARCH DIRECTED TOWARD A FEASIBILITY STUDY DEALING WITH THE INTEGRATION OF GRAVITY DATA. Final rept.
by W. A. Heiskanen, Helmut Moritz, and Ivan I. Mueller. Jun 64, 30p IGPC-31
Contract AF19 628 1628, Proj. 7600, Task 760002
AFCRL 64 566 I

Unclassified report

THE EQUATION OF STATE OF HYDROGEN AT HIGH PRESSURES,
by A. A. Abrikosov. 3 Mar 58, 30p T-81
TT 64 71362

Unclassified report

Trans. of Astronomicheskii Zhurnal (USSR) 1954, v. 31, p. 112ff.

Descriptors: (*Planetary atmospheres, Hydrogen), (*Hydrogen, Equations of state), Atoms, Diatomic molecules, Transformations, Pressure, Density, Mathematical analysis, USSR.

The equation of state of hydrogen is examined for P > 2,000,000. atm. At 2,400,000 atm. there exists a transition from the molecular to the atomic modification accompanied by a discontinuous increase in the density from 0.621 g/sq.cm. to 1.12 gm/sq.cm. The limits of applicability of the calculations are explored. (Author)

AD-605 749 Div. 2, 12
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME RESULTS TAKEN FROM OBSERVATIONS OF THE FIRST RUSSIAN EARTH SATELLITES,
by H. K. Paetzold. 15 May 58, 26p T-89
TT 64 71350

Unclassified report

Trans. of a report issued by Max-Planck-Institut fur Aeronomie, Institut fur Stratospharen-Physik Weissenau und Technischule, Munich 1958 .

Descriptors: (*Upper atmosphere, Satellites (Artificial)), (*Satellites (Artificial), USSR), Orbital trajectories, Deceleration, Atmospheric temperature, Density, Ionosphere, Radio signals, West Germany.

The appearance of the first artificial satellites was not significant only as the first step in the direction of eventual rocket or space flight. The main purpose for them insofar as the International Geophysical Year 1957-1958 was concerned, was for the research of the outermost layers of the earth's atmosphere and the adjacent interplanetary space. The observations of the first satellites, which were made in Germany, permit us to arrive at some conclusions concerning the above goal. A review of the orbit elements shows some agreement concerning the state of the upper atmosphere which may be deduced from some observations of orbit changes as well as of radio signals. (Author)

AD-605 775 Div. 2
OTS Prices: HC $4.00/MF $1.00

Woods Hole Oceanographic Institution, Mass.
NARRATIVE OF CHAIN CRUISE NO. 21, AUGUST-DECEMBER 1961,
by J. B. Hersey, E. E. Hays, and A. D. Voorhis.
Jun 64, 148p WHOI-Ref-64-22
Contracts Nonr1367 00, Nonr2196 00

Unclassified report

See also AD-604 094.

Descriptors: (*Oceanology, Reports), Marine geophysics, Marine geology, Seismology, Thermodynamics, Ocean bottom sampling, Oceanographic equipment, Hydrographic surveying, Atlantic Ocean, Mediterranean Sea, Oceanographic data.

A program of geophysical and geological research was conducted across the North Atlantic Ocean along the track Woods Hole - Bermuda - Great Meteor Seamount - Madeira - Gibraltar and through the Mediterranean Sea to Beirut and back over a similar track to Woods Hole. This report contains (1) a narrative of the cruise, (2) tabulations of the locations of seismic profiles, heat-flow measurements, dredge hauls, cores, camera lowerings, hydrographic stations, thermistor chain profiles, and sound velocity measurements, and (3) a selection of bottom photographs. (Author)

AD-605 808 Div. 2, 12, 30
OTS Prices: HC $2.00/MF $0.50

Iowa State Univ., Iowa City.
S.U.I. EXPERIMENT FOR THE INTERPLANETARY MONITORING PLATFORMS (IMP) F AND G,
by L. A. Frank. 4 Aug 64, 42p SUI-64-32
Contract Nonr1509 06; Grant NsG233 62

Unclassified report

Descriptors: (*Scientific satellites, Instrumentation), (*Upper atmosphere, Scientific research), Protons, Electrons, Plasma physics, Electron multipliers, Scintillation counters, Telemeter systems, Atmosphere, Geophysics.

AD-605 816 Div. 2, 19
OTS Prices: HC $3.00/MF $0.75

Air Force Cambridge Research Labs., Bedford, Mass.
GEOMETRY AND FIRST-ORDER ERROR STATISTICS FOR THREE-AND-FOUR-STATION HYPERBOLIC FIXES ON A SPHERICAL EARTH,
by Edward A. Lewis. Jun 64, 97p
Proj. 4662
AFCRL 64 461, AFCRL PSRP29

Unclassified report

Descriptors: (*Geodesics, Errors), (*Hyperbolic navigation, Errors), Earth, Spheres, Geometry, Direction finding, Probability, Statistical functions, Electromagnetic waves, Propagation, Time, Numerical analysis, Navigation.

Certain fundamental geometric properties of hyperbolas and ellipses on the surface of a sphere are developed. A first-order theory is then presented for the random errors in the location of a point on a spherical earth, by the intersection of spherical hyperbolas physically determined by a time difference technique in which the individual errors are 'normally' distributed and uncorrelated. Two cases are treated: (a) Four time-measuring stations working as two independent pairs, and (b) Three time-measuring stations working on a common time-base. In both cases, the contours of equal error probability density are shown to be ellipses and their properties are discussed. In both cases the distribution of radial error without regard to direction is given by a generalized distribution function which contains the Rayleigh distribution as a special case. Using the general form, the most probable mean, root mean square, and median radial errors are obtained. The results are adaptable to include errors in ordinary direction finders as well as those of the hyperbolic type. Numerical examples are included. (Author)

AD-605 830 Div. 2, 25
OTS Prices: HC $1.00/MF $0.50

Graduate Research Center of the Southwest, Dallas, Tex.
THERMAL UPPER LIMIT ON EDDY DIFFUSION IN THE MESOSPHERE AND LOWER THERMOSPHERE,
by Francis S. Johnson and Eugene M. Wilkins.
1963, 14p
Contract CWB10531

Unclassified report

ment in spherical harmonics. Thus we must know the gravity field, i. e., the coefficients of this development, for precise prediction of satellite orbits. These spherical harmonics coefficients can be determined either from the analysis of known satellite orbits or from gravity measurements at the surface of the earth. The accuracy of the orbital elements of the satellites, computed from gravity anomalies, the determination of the gravimetric constant G M, and the position of the tracking stations are handled in this paper. If the gaps of the gravity anomalies in the oceans at the continents can be filled, the gravimetric method can help the satellite geodesist in many respects. (Author)

AD-605 662 Div. 2
OTS Prices: HC $1.00/MF $0.50

Brown Univ., Providence, R. I. Div. of Applied Mathematics.
SOME THREE-DIMENSIONAL EFFECTS IN SURF.
Technical rept. no. 6,
by R. B. Turner and R. E. Meyer. Aug 64, 18p
Contract Nonr562 34, Proj. NR083 167

Unclassified report

Descriptors: (*Water waves, Hydrodynamics), (*Beaches, Water waves), Terrain, Motion, Equations, Mathematical analysis, Two-dimensional flow, Three-dimensional flow.

Asymptotic equations are presented of surf on shallow beaches with a geometry causing longshore variations in the water motion. In general, such surf is found to be governed by the three-dimensional, nonlinear shallow-water equations. However, when the seabed profile parallel to shore is shallower than the profile normal to shore, the asymptotic equations are shown to differ only in minor respects from those of two-dimensional surf. Such 'weakly three-dimensional' surf can be analysed directly in terms of the results of the two-dimensional theory. (Author)

AD-605 688 Div. 2
OTS Prices: HC $3.00/MF $0.75

Intermountain Weather, Inc., Salt Lake City, Utah.
THE INFLUENCE OF HAZE ON INFRARED RADIATION MEASUREMENTS DETECTED BY SPACE VEHICLES.
Final rept.
by Wilford Zdunkowski, Donald Henderson, and J. Vern Hales. Jul 64, 98p
Contract Cwb10648

Unclassified report

Descriptors: (*Infrared radiation, Haze), (*Haze, Infrared radiation), (*Meteorological satellites, Infrared radiation), Clouds, Ice, Scattering, Absorption, Spectra (Infrared), Atmospheric temperature, Stratosphere, Wave transmission, Spacecraft, Infrared detectors.

A method is outlined to investigate the influence of thin cirrus layers, invisible to the naked eye, upon the long wave flux leaving the atmosphere. Radiative properties of spherical ice particles acting as primary scatterers and absorbers of infrared radiation are taken into account. The combined radiative effects of ice particles with gaseous absorbers were estimated to determine the influence of thin cirrus layers on the outgoing long wave radiation within the 6.0 - 6.5 micron and 8 - 12 micron region as well as the total infrared spectrum. An estimate is also made of the effect of the stratospheric haze layer upon the outgoing radiation. (Author)

AD-605 718 Div. 2, 15, 25
OTS Prices: HC $3.00/MF $0.75

Intermountain Weather, Inc., Salt Lake City, Utah.
VISUAL RANGE AS A FUNCTION OF FOG DROPLET DISTRIBUTION.
Final rept.
Aug 64, 87p
Contract Cwb10657

Unclassified report

Descriptors: (*Visability, Fog), (*Fog, Visability), (*Meteorology, Fog), Particle size, Water vapor, Drops, Measurement, Thermodynamics, Mathematical models, Statistical functions, Clouds, Emissivity, Absorption (Physical), Condensation, Micrometeorology, Density, Temperature, Cooling, Surface properties, Humidity.

A complete review of published information on droplet formation and growth, droplet distribution in fog, and the cloud thermodynamic processes was completed. This investigation clearly indicated a great dearth of information available concerning droplet distributions for droplets where r is less than 3 microns. The radiative cooling investigation is reported. An analysis of factors in the growth of cloud or fog droplets was made which indicated that the droplet growth rate is a function of curvature, the latent heat which must be transferred from the surface of the droplet, surface tension, and salinity. This phase of the work clearly shows that for certain ranges of radius r, the growth rate dr/dt is much less dependent on the relative humidity than might have been thought. The development of a generating function by which fog droplet distributions can be approximated is reported.

AD-605 740 Div. 2, 25
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE STRENGTH OF UNDERGROUND CAVITIES OF SPHERICAL AND SPHEROIDAL GEOMETRY,
by J. M. Green. Oct 61, 30p RM-2798-AEC
Contract AT11 1 135

Unclassified report

Descriptors: (*Loading (Mechanics), Underground structures), (*Underground structures, Strength), Geometric forms, Stresses, Hydrostatics, Pressure, Compressive properties, Geophysics.

Expressions are exhibited for the static-stress distribution over the surface of a degenerate prolate spheroidal cavity which is subjected to a given internal pressure and a given lithostatic loading at infinity. The hoop stress is evaluated at the apex of the spheroidal cavity and is compared with the hoop stress at the corresponding point of a spherical cavity, which is subjected to the same loading. Both cavities are presumed to fail when the hoop stress ceases to be compressive. It is shown that the maximum internal pressure which may be sustained by each of the cavities depends on the Poisson ratio. For certain values of the Poisson ratio, the spherical cavity can actually contain larger internal pressures than the spheroidal cavity, in spite of the fact that when the cavities are 'empty' the spheroidal cavity has a hoop stress at its apex which is more compressive than that of the spherical cavity. These conclusions are of interest in the choice of a geometry for underground cavities which are designed to contain materials held at very high pressures. (Author)

AD-605 743 Div. 2, 4, 25
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.

AD-605 924 Div. 2, 8
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
ENGINEERING EVALUATION OF THE METEOROLOGICAL SATELLITE GROUND RECEIVING SYSTEM,
by Arnold C. Peterson. May 64, 36p
Task 1A0 25001A126 01
USAEL TR2460

Unclassified report

Descriptors: (*Meteorological satellites, Ground support equipment), (*Telemetering receivers, Ground support equipment), Cloud cover, Pictures, Facsimile transmission, Facsimile equipment, Performance (Engineering), Meteorology.

This report is an evaluation of the performance of the Meteorological Satellite Ground Receiving System (MSGRS) for Army use, based on a number of cloud-cover automatic picture transmissions (APT) received from the TIROS VIII satellite. From the picture received and analyzed, it was determined that the pictures, on Polaroid film, were of excellent clarity and definition to be used for cloud-cover formation analysis. The sensitivity and gain of the MSGRS is more than sufficient to receive excellent pictures during the satellite's orbit from almost horizon-to-horizon, where the maximum range approaches 2000 miles. Comments on the operation of the angular tracking and picture-processing portions of the system are included in the report. Also discussed are corrected problem areas. Based on a determined minimum usable signal level and signal-to-noise ratio for a minimum acceptable picture, an analysis was made to determine the possibility of replacing the helical rotatable antenna with a fixed-antenna system, consisting of a 1/4 lambda stub and an equiangular spiral antenna. From both theoretical data and pictures received using the fixed-antenna system, this antenna arrangement appears to be feasible. (Author)

AD-605 949 Div. 2, 30
OTS Prices: HC $5.00/MF $1.00

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
THE PREDICTION OF POINT AND MEAN GRAVITY ANOMALIES THROUGH THE USE OF A DIGITAL COMPUTER.
Scientific rept. no. 9,
by Richard H. Rapp. Jun 64, 196p IGPC-43
Contracts AF19 628 2771 and AF23 601 3874,
Projs. 7600, 1613, Task 760002
AFCRL 64 575

Unclassified report

Descriptors: (*Gravity, Mathematical prediction), (*Geodesics, Programming (Computers)), (*Digital computers, Geodesics), Isostatic change, Statistical analysis, Least squares method, Geophysics.

The least squares predictions of point anomalies have been carried out in two distinct areas of the United States. The statistical quantities needed for their use in the prediction equations of Moritz were computed using some 32,000, 5' x 5' mean anomalies. The mean anomalies and their accuracies in these two areas were predicted in 5' x 5' and 30' x 30' squares. Computer programs written for the IBM 7094 were used in these computations. (Author)

AD-605 950 Div. 2
OTS Prices: HC $2.00/MF $0.50

Institute of Geodesy, Photogrammetry and Cartography, Ohio State Univ. Research Foundation, Columbus.
ON GRAVITY REDUCTIONS.
Scientific rept. no. 10,
by Erwin Groten. Jun 64, 30p IGPC-44
Contract AF19 628 2771, Projs. 7600, 1613, Task 760002
AFCRL 64 576

Unclassified report

See also AD-605 949.

Descriptors: (*Gravity, Reduction), (*Geodesics, Gravity), Isostatic change, Geophysics, Boundary valve problems, Harmonic analysis, Errors, Earth.

Bouguer's and isostatic methods for the evaluation of gravity anomalies on the earth's physical surface are discussed. Errors involved in the reduction of gravity down to sea level are compared for condensation, isostatic, and Rudzki's anomalies. The connections between gravity anomalies at the earth's surface and on the geoid are discussed. (Author)

AD-605 952 Div. 2
OTS Prices: HC $1.00/MF $0.50

Georgetown Coll., Washington, D. C. Observatory.
RESEARCH DIRECTED TOWARD REFINEMENT OF GEODETIC TECHNIQUES UTILIZING TERRESTRIAL AND SPATIAL CONFIGURATIONS.
Final rept.,
by Francis J. Heyden. 21 Jul 64, 10p
Contract AF19 628 2491, Proj. 7600, Task 760006
AFCRL 64 699

Unclassified report

Descriptors: (*Solar eclipses, Photoelectric effect), (*Photoelectric effect, Solar eclipses), (*Astronomical geodesics, Solar eclipses), Geodesics, Astrophysics, Photographic analysis.

The total eclipse of the sun on July 20, 1963 was observed near Ellsworth, Maine by staff members of Georgetown Observatory. Clouds interfered with the principal experiments but partial success was obtained by two methods for determining the time of mid totality. Only the photoelectric data have been reduced for this report. (Author)

AD-605 965 Div. 2, 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
USE OF COMPUTERS IN THE PROCESSING AND ANALYSIS OF GEOGRAPHIC INFORMATION,
by Richard C. Kao. Aug 62, 29p P-2593

Unclassified report

Paper presented at the Conference on Cartography and Geodesy sponsored by the Div. of Earth Sciences, National Academy of Sciences, National Research Council, 12 May 62, Washington, D. C.

Descriptors: (*Geography, Data processing systems), (*Computers, Geography), Computer storage devices, Mapping, Scientific research, Analysis.

The impact of high-speed computers on the collection and use of data in geographic research is assessed.

AD-605 968 Div. 2
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.

Prepared in cooperation with Ling-Temco-Vought, Inc., Dallas, Tex.

Descriptors: (*Upper atmosphere, Thermal properties), (*Diffusion, Upper atmosphere), Atmosphere, Thermodynamics, Stability, Turbulence, Absorption, Solar radiation, Geophysics, Heat transfer.

The thermodynamic stability of the mesosphere and lower thermosphere requires that there be a downward transport of heat associated with any turbulent mixing. The amount of available heat that could be transported downward through any level by eddy conduction can be determined from the absorption of solar energy above that level. This can be used to place an upper limit on the eddy coefficient, and this limit is substantially below values frequently quoted on the basis of vapor or meteor trail studies. The upper limit is about 1000000 sq cm/s above 80 km and about 4 x 100000 sq cm/s from 50 to 70 km. The fact that diffusive equilibrium distributions of atmospheric constituents prevail no lower than 105 km, where the molecular diffusion coefficient is 1000000 sq cm/s, indicates that the eddy coefficient at that altitude has the limiting value indicated by the thermal structure. (Author)

AD-605 833 Div. 2, 15
OTS Prices: HC $1.00/MF $0.50

Johns Hopkins Univ., Baltimore, Md.
ON THE EQUATIONS OF LARGE-SCALE METEOROLOGICAL PHENOMENA.
Technical rept. nos. 18, 21,
by Robert R. Long. Sep 64, 20p
Contract Nonr4010 01; Grant WBG21, Proj. NR082 104
Unclassified report

Descriptors: (*Meteorological phenomena, Equations), (*Equations, Meteorological phenomena), Atmospheric motion, Mathematical analysis, Series, Differential equations, Iterative methods, Meteorology.

The solutions of the equations of motion governing large-scale atmospheric disturbances are expanded in infinite series involving powers and products of three small parameters, characterizing the mass and velocity fields. The equations of the first approximation are basically non-linear, but can be combined into a single differential equation in one dependent variable. An example is given of a steadily propagating disturbance satisfying these equations. (Author)

AD-605 838 Div. 2
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
TROPOPAUSE DEFINITION AND HOURLY FLUCTUATIONS.
Environmental Research Papers,
by Arthur J. Kantor. Aug 64, 44p
Proj. 8624
AFCRL 64 660 AFCRL ERP41
Unclassified report

Descriptors: (*Tropopause, Analysis), Meteorological parameters, Meteorological balloons, Temperature, Pressure, Moisture, Weather forecasting, Least squares method, Radiosondes, Atmospheric sounding.

A unique seven-day series of hourly rawinsonde observations completed in April 1960 makes possible a detailed study of the tropopause and its hourly fluctuations. Tropopauses are grouped serially, according to synoptic events and tropopause pressures, as moving or stationary. Hourly tropopause pressures are estimated and standard errors of estimate are computed for each tropopause set by least squares regression. Pressures are determined using the latest WMO objective criteria. When the lowest tropopause appears at a pressure over 500 mb, a change in criteria is proposed to preclude errors such as mistaking frontal surfaces for tropopauses, but to retain multiple, folded or reforming tropopauses consistently. Simultaneous rather than alternating transmission and transcription of temperature, moisture, and pressure data is suggested as an improvement. (Author)

AD-605 904 Div. 2
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Service, Ottawa (Canada).
RECENT VERTICAL MOVEMENTS ON THE FAR EASTERN SEA FLOORS,
by V. F. Kanaev. Aug 64, 12p NRC-C-5008
DSIS T407R; TT 64 71429
Unclassified report

Trans. of Okeanologiya (USSR) 1963, v. 3, no. 4, p. 660-673. Also available from NRC as C-5008.

Descriptors: (*Ocean bottom topography, Pacific Ocean), Oceanology, Seas, Far East, Oceanographic data, Depth finding, Echo ranging, USSR.

Within the limits of the Far Eastern coastal seas and the northwest part of the Pacific Ocean there is a wide development of abrasional-accumulational planation surfaces. Information on the morphology and morphometry of the planation surfaces has been obtained as result of detailed work carried out by an expeditionary vessel with recording echo-sounders. From the echograms the edge-depth and slope of the planation surfaces were determined and mean values of these characteristics were calculated, both for the area of the explorations as a whole and also for the different seas and different sectors of the coastal shelf. Analysis of all the data premitted the demonstration of considerable differences in the edge-depth and slope of the planation surfaces, differences testifying to the presence of vertical movements of the crust.

AD-605 916 Div. 2
OTS Prices: HC $1.00/MF $0.50

High Altitude Observatory, Boulder, Colo.
DYNAMICS OF THE UPPER ATMOSPHERE.
Final rept.,
by Bernhard Haurwitz and Julius London.
31 Jul 64, 25p
Contract AF19 604 5488, Proj. 8604, Task 860405
AFCRL 64 612
Unclassified report

Descriptors: (*Upper atmosphere, Dynamics), Ozone, Distribution, Atmosphere, Atmospheric motion, Thermodynamics, Gravity, Atmospheric tides, Diurnal variations, Noctilucent clouds Photochemistry.

It has been shown that longitudinal and temporal changes of total ozone occur in response to circulation patterns and their time changes. Calculations of the non-equilibrium state of ozone show that day-time concentrations must be less than in the case of steady photochemical equilibrium. The importance of the 12- and 24-hourly tides in the interpretation of wind observations at 80-100 km has been demonstrated on the basis of radio meteor observations. Approximation formulae have been developed for the study of internal gravity waves in a non-isothermal atmosphere. The wave structure of noctilucent clouds has been interpreted.

This report deals with some theoretical investigations on trajectories of the two-body problem in Celestial Mechanics. Specifically, consideration is given elliptic trajectories having the same attracting focus and corresponding to a fixed value of the total energy. The purpose of the report is twofold: (a) to find the envelope curve for the planar system of elliptic trajectories passing through a fixed point, (b) to determine which one of the two trajectories passing through two fixed points yields a 'strong' minimum for the action integral in the sense of the calculus of variations.

AD-606 111 Div. 2, 30
OTS Prices: HC $2.00/MF $0.50

Rochester Univ., N. Y.
THE FLUX OF COSMIC RAY PARTICLES WITH Z > OR = TO 2 OVER TEXAS,
by A. Engler, M. F. Kaplon and J. Klarmann.
1958, 34p
AFOSR TN58 670; PB 136 182

Unclassified report

Supported in part by the United States Air Force, Office of Scientific Research, Air Research and Development Command.

Descriptors: (*Cosmic rays, Texas), Balloons, Atmosphere, Scanning, Ionization, Nuclei, Alpha particles, Lithium, Boron, Beryllium, Mathematical prediction, Equations, Diffusion, Test methods.

The fluxes of multiply charged cosmic ray particles have been measured with nuclear emulsions in a high altitude balloon flight. The identification of alpha particles was based on 'blob-gap' measurements while those of elements with Z > or = to 3 on cosmic ray densities. The charge resolution obtained was satisfactory. To calculate the fluxes at the top of the atmosphere an extrapolation procedure, previously introduced in this laboratory, was employed. Two sets of parameters which account for the interactions in the residual atmosphere, differing considerably as far as their influence on the fluxes of light elements is concerned, were used. (Author)

AD-606 112 Div. 2
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
ALTITUDE VARIATION OF RAYLEIGH, AEROSOL, AND OZONE ATTENUATING COMPONENTS IN THE ULTRAVIOLET REGION.
Environmental research papers,
by L. elterman. May 64, 34p
Proj. 7670
AFCRL 64 400; AFCRL ERP20

Unclassified report

Descriptors: (*Ultraviolet radiation, Attenuation), (*Atmosphere, Ultraviolet radiation), Aerosols, Ozone, Scattering, Light transmission, Absorption, Optical properties.

Atmospheric extinction in the ultraviolet is considered spectrally and with altitude as follows: (1) The Rayleigh scattering coefficients are determined by utilizing spectral scattering cross sections with molecular number densities from the U. S. Standard Atmosphere; (2) The aerosol attenuation coefficients are established from available transmission measurements in conjunction with a suitable aerosol density distribution. (3) The atmospheric ozone absorption coefficients result from Vigroux's coefficients applied to a generalized ozone distribution. The resulting coefficients and computed optical thickness values are placed in the format of a series of tabulations for wavelengths from 0.27 to 0.55 microns, with the parameters arrayed at kilometer intervals to an altitude of 50 kilometers. The tabulations presented permit various exploratory calculations including horizontal, vertical, and slant-path transmission from sea level and from space into the atmosphere; also, between any two desired altitudes within the occluding ozone region. (Author)

AD-606 118 Div. 2
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
SHEAR DEFORMATION OF UPPER MANTLE MINERAL ANALOGUES: TEST TO 55kb AT 27C.
Environmental research papers,
by R. E. Riecker and K. E. Seifert. Jul 64, 26p
Proj. 8652
AFCRL 64 549; AFCRL ERP30

Unclassified report

Descriptors: (*Geology, Earthquakes), (*Rock forming minerals, Shear stresses), Deformation, Minerals, Temperature, Pressure, Seismology, Hydrostatic pressure, Petrography, Mechanical properties, Test methods, Equations, Geophysics, Faults (Geology).

Shear deformation of upper mantle mineral analogues forsterite, enstatite, diopside and labradorite at 27C temperature, 5 to 55 kb average pressure, and at strain rates from 1/sec to .003/sec indicates that all minerals have high average shear strengths. Shear strength for North Carolina and Hawaiian olivine is 15.17 kb at 50 kb average pressure. Average shear strength for Madagascar diopside and Labrador labradorite are 14.90 kb to 14.03 kb and 13.15 kb, respectively, at 50 kb average pressure. Each shear stress-normal pressure curve is resolvable into two regions of constant but different slopes separated by a broad transitional knee. These represent separate and distinguishable behavior. The predominant behavior at all pressures is cataclastic; intragranular flow becomes significant only at high pressures. Violent snapping accompanies rotation at 27C and relates to surficial stick-slip between sample and pistons. All snapping ceases at 300C. Enstatite inverts to clinoenstatite at 35 ± 1 kb mean pressure under the influence of shear stress at 27C. (Author)

AD-606 141 Div. 2
OTS Prices: HC $1.00/MF $0.50

High Altitude Observatory, Boulder, Colo.
THE EFFECT OF STRATOSPHERIC TRANSPORT PROCESSES ON THE OZONE DISTRIBUTION [AND] OZONE VARIATIONS AND THEIR RELATION TO STRATOSPHERIC WARMINGS.
Scientific rept. no. 8,
by Julius London and Cuddapah Prabhakara. Aug 64, 25p
Contracts AF19 604 5488, AF19 604 5492, Proj. 8604, Task 860405
AFCRL 64 501

Unclassified report

Papers from the Proceedings of the International Symposium on Stratospheric and Mesospheric Circulation, 20-31 Aug 62, Berlin, Germany. Reprint from Freie Univ., Berlin. Institut fur Meteorologie und Geophysik. Meteorologische Abhandlungen (West Germany) 1963, v. 36, p. 291-310.

Descriptors: (*Ozone, Stratosphere), (*Stratosphere, Ozone), Atmosphere, Transport properties, Distribution, Photochemistry, Meteorology, Geophysics.

METEOROLOGICAL ROCKETS STEP UPWARD,
by William W. Kellogg. Jan 62, 7p P-2516
Unclassified report

Summary of a talk given on the occasion of the Joint American Meteorological Society-Rocket Symposium Dinner, El Paso, Texas, 6 Dec 61.

Descriptors: (*Sounding rockets, Meteorology), (*Meteorology, Sounding rockets), Atmosphere, Meteorological parameters, Scientific research, Scientific organizations, Symposia.

Summary of a talk given on the occasion of the Joint American Meteorological Society-Rocket Symposium Dinner, El Paso, Texas, December 6, 1961. (Author)

AD-605 977 Div. 2, 8
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
A REVIEW OF AURORAL CHARACTERISTICS,
by L. Blitzer. 1957 16p RW-GM-42-182,
RW-GM-TM151
Unclassified report

Descriptors: (*Aurorae, Physical properties), (*Atmospherics, Aurorae), Ionospheric disturbances, Magnetic storms, Periodic variations, Sunspots, Wave transmission, Electromagnetic waves, Ionospheric propagation, Radio interference, Bibliographies.

The report is intended to provide only a brief description of auroral characteristics plus an index of pertinent literature.

AD-606 008 Div. 2, 15
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co.,
Philadelphia, Pa.
A PROPOSED EXTENSION OF THE ARDC MODEL ATMOSPHERE-1956 FROM 340 TO 1000 MILES.
Technical information series,
by Donald N. Vachon. 25 Nov 58, 44p
R58SD291, GE Aerophysics ORM21
Contract AF04 645 24
Unclassified report

Formerly published as GE Aerophysics TM88, 6 Aug 58.

Descriptors: (*Atmosphere models, Mathematical models), (*Mathematical models, Atmosphere), Lapse rate, Atmospheric temperature, Pressure, Density, Molecular properties, Gravity, Acceleration.

A model atmosphere is proposed as an extension of the ARDC Model Atmosphere (AD-110 233). The use of only two basic assumptions simplifies the task of modifying this extension when data are available at these altitudes. (Author)

AD-606 025 Div. 2
OTS Prices: HC $4.00/MF $0.75

RAND Corp., Santa Monica, Calif.
MAGNETOSPHERE AND RADIATION BELTS,
by J. W. Kern. Sep 64, 122p P-2917
Unclassified report

Descriptors: (*Upper atmosphere, Terrestrial magnetism), (*Terrestrial magnetism, Upper atmosphere), (*Plasma physics, Upper atmosphere), Ionospheric disturbances, Magnetic storms, Solar wind, Ionization, Atmosphere, Geophysics.

The interactions among the geomagnetic field, charged particles, and neutral ionized gases are discussed.

AD-606 026 Div. 2
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
ATMOSPHERES OF THE PLANETS,
by G. F. Schilling. Sep 64, 61p P-2964
Unclassified report

Descriptors: (*Planetary atmospheres, Reviews), (*Solar systems, Planetary atmospheres), Planets, Astronomy, Theory.

AD-606 027 Div. 2
OTS Prices: HC $2.00/MF $0.75

RAND Corp., Santa Monica, Calif.
SHAPE AND INTERNAL STRUCTURE OF THE MOON,
by Donald L. Lamar and Jeannine McGann.
Sep 64, 37p RM-3964-PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Moon, Physical properties), Surface properties, Density, Distribution, Geometric forms, Models (Simulations), Moments.

The internal structure of the Moon has long been of interest to geophysicists. However, the history of investigation of this problem has been particularly frustrating, since advancements in our knowledge of the lunar parameters have been accompanied by increasingly complex and diverse models to explain them. The report reviews the pertinent data with emphasis on the Moon's gross shape and considers the density distribution required under two plausible models of internal structure. (Author)

AD-606 037 Div. 2
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PROCEEDINGS OF THE CONFERENCE ON DISCRETE PARAMATERS IN COSMOLOGY, June 29-30, 1964,
comp. by Thornton Page. Sep 64, 30p RM-4267-RC
Unclassified report

Descriptors: (*Astronomy, Symposia), Partial differential equations, Relativity theory, Galaxies, Catalogs, Astrophysics, Statistical tests, Theory.

Recent theories and observations concerning RAND-sponsored research on galactic discretization are discussed.

AD-606 082 Div. 2
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ENVELOPE OF ELLIPTIC TRAJECTORIES,
by P. Lanzano. 15 Aug 58, 10p
STL-GM-TN-0165-00170
Unclassified report

Descriptors: (*Celestial mechanics, Trajectories), (*Trajectories, Celestial mechanics), Calculus of variations, Integrals, Partial differential equations, Astronomy, Mechanics.

4. Chemistry

AD-605 129 Div. 4, 10
OTS Prices: HC $2.00/MF $0.50

Pennsylvania State Univ., University Park.
DETERMINATION OF THE DECOMPOSITION KINETICS OF HYDRAZINE USING A SINGLE-PULSE SHOCK TUBE.
by E. T. McHale, B. E. Knox, and H. B. Palmer.
Aug 64, 36p PSU-12-P
Unclassified report

Report on Project Squid prepared in cooperation with Virginia Univ., Charlottesville, Contract Nonr3623 00, Proj. NR098 038. Presented at the International Symposium on Combustion (no. 10) Cambridge Univ., England, Aug 64.

Descriptors: (*Hydrazine, Decomposition), Reaction kinetics, Thermochemistry, Heat of activation, Impurities, Combustion, Shock tubes.

The rate of decomposition of carefully purified hydrazine was measured by a single-pulse shock tube method over the temperature range, 970K to 1120K and the pressure range, 2. 3 to 8. 6 atmospheres, at a concentration of about 1 mole per cent in argon. The experimental data on reaction order, activation energy, and stoichiometry, together with kinetic and thermochemical considerations, lead to the conclusion that the decomposition kinetics obey a simple non-chain mechanism. Possible chain mechanisms are examined in detail and found to be at variance with the observations. By making use of some recent data of Michel and Wagner, a high-pressure limiting rate constant is obtained for the reaction, N2H4 yields 2 NH2, over the temperature range from 970K to 1550K. Thus D(H2N-NH2) is determined to be 54 kcal, with an uncertainty of about 2 kcal. At low pressures, approximately 6 effectively classical oscillators appear to contribute energy to the unimolecular decomposition of N2H4. An apparent activation energy of ca. 36 kcal is predicted for the second-order flame reaction, in agreement with experiments. (Author)

AD-605 146 Div. 4
OTS Prices: HC $2.00/MF $0.50

California Univ., Los Angeles.
EQUILIBRIUM POLYMERIZATION; POLYFUNCTIONAL INITIATORS.
Technical rept. no. 4,
by M. E. Baur and A. Eisenberg. 15 Aug 64, 50p
Contract Nonr233 87; Grant PHS GM11125 01
Unclassified report

Descriptors: (*Polymerization, Chemical equilibrium), Catalysts, Reaction kinetics, Theory, Molecular structure, Polymers, Chemical reactions.

The equilibrium polymerization theory of Tobolsky and Eisenberg is extended to the case of initiation by polyfunctional species, under the assumption that only a single monomer is involved and no cross-linking occurs. A general indexing scheme is given which permits derivation of the relation between degree of polymerization and equilibrium constants for initiation and propagation steps for any functionality of initiator. An explicit derivation for the case of trifunctional initiator is given, and the result for general functionality is provided. (Author)

AD-605 163 Div. 4, 10
OTS Prices: HC $1.00/MF $0.50

Stauffer Chemical Co., Richmond, Calif.
HIGH ENERGY OXIDIZERS.
Quarterly technical summary rept. no. 2, 1 May-1 Aug 64,
by K. O. Christe, A. E. Pavlath, and E. G. Wallace.
1 Aug 64, 10p
Contract Nonr4019 00, Proj. NR093 035, ARPA Order 399 62
Unclassified report

See also AD-404 779

Descriptors: (*Oxidizers, Synthesis (Chemistry)), (*Chlorine compounds, Fluorides), Complex compounds, Nitrogen compounds, Oxides, Nitric acid, Chemical reactions, Stability.

The reaction of nitrogen pentoxide and chlorinetrifluoride did not result in the desired C1F2(+)NO3(-). The main product isolated was nitryifluoride. The small amount of residue obtained did not contain chlorine in any valency state. When chlorinetrifluoride reacted with fuming nitric acid again no C1F2(+)NO3(-) could be detected. A solid residue of low thermal stability was obtained, which also did not contain any chlorine. In the vapor phase the presence of C102F was established. The reaction between NOF and C1F gave a solid complex at -78C., which rapidly decomposed at slightly higher temperatures. No complex formation was observed between C103F and C1F in the range of -78C. to room temperature. (Author)

AD-605 166 Div. 4, 10
OTS Prices: HC $0.50/MF $0.50

Naval Research Lab., Washington, D. C.
SUPERCOOLING OF HYDRAZINE.
Final rept.,
by J. T. Leonard and R. N. Hazlett. 12 Aug 64, 18p
NRL 6130
Unclassified report

Descriptors: (*Hydrazine, Supercooling), (*Supercooling, Hydrazine), Surface properties, Drops, Nucleation, Liquid rocket propellants, Storage, Freezing point depressants, Freezing, Colloids, Silicone plastics, Equations of state.

The supercooling of hydrazine in thin-walled capillaries and as droplets suspended in silicone oil has been investigated by observing the freezing points of samples held in the cold stage of a microscope. A wide range in capillary diameters was employed, but a smooth correlation between capillary size and degree of supercooling was not obtained due to heterogeneous nucleation at the glass surface. Suspension of hydrazine droplets in silicone oil permitted the study of much smaller samples, while eliminating the nucleating effect of solid surfaces. Also, by this procedure, foreign nuclei present in the original sample were isolated in a certain few droplets, while the majority, having been freed of foreign nuclei, froze by homogeneous nucleation. Under these conditions, the maximum degree of supercooling of hydrazine was 120C. Using data from these experiments together with estimated values for the heat of fusion and for the free energy of activation for self-diffusion, the solid-liquid interfacial free energy for hydrazine was calculated from the theory of homogeneous nucleation to be 39.5 ergs/sq. cm. Thus the supercooled state is a normal one that can be dealt with thermodynamically. The high degree of supercooling of small droplets of hydrazine would not be feasible with bulk hydrazine. At present, it is felt that in order to keep hydrazine in the liquid state at low temperatures the depression of its freezing point by blending with other fuels would be the most reliable method. (Author)

This discussion covers an attempt to derive the steady state of meridional and vertical ozone distribution by considering a combination of photochemical and atmospheric transport processes. The new equilibrium distributions are derived for the year and for each of the seasons separately. One of the strongest stratospheric warmings associated with a marked breakdown of the circumpolar vortex occurred during the period January-February 1958. At this time there were relatively few data of the stratospheric distribution of ozone. However, as a result of the IGY program, a large number of total ozone observations were taken, and it is thus possible to analyse the variations of total ozone amount as related to changes in the structure of the polar stratosphere at the time of this event. (Author)

AD-606 144 Div. 2, 8, 30
OTS Prices: HC $4.00/MF $0.75

Bissett-Berman Corp., San Diego, Calif.
DEVELOPMENT OF BUOY-MOUNTED OCEANOGRAPHIC SENSORS (BMOS).
Progress rept. Phase 1, no. 1,
by Don J. Cretzler, Neil L. Brown, Harold Azaren, Sam A. Ruttenberg, and Edward K. Dean. 1 Aug 64, 120p BBC-C104-1
Contracts Nonr 4532 00, N62306 1357, Proj. NR083 195
Unclassified report

Prepared in cooperation with Texas A. and M. Univ. and Oceanographic Industries, Inc.

Descriptors: (*Oceanographic data, Collecting methods), (*Buoys, Data transmission systems), Oceanographic equipment, Power supplies, Batteries and components, Transducers, Digital systems, Antifouling coatings, Underwater equipment, Electronic recording systems, Oceanology.

An unmanned oceanographic data collection station is considered. This report covers in detail the accomplishments to date during Phase I. Specifically, the following are dealt with: (a) Evaluation of potential sensor power sources (batteries); (b) evaluation of potentially useful pressure transducers. (c) analysis of the advantages and disadvantages of digital versus frequency transmission modes for sensor-to-buoy data link; (d) development of and potential use of an inductively coupled clamp-on sensor technique; (e) techniques for abatement of biological growth (fouling) on sensitive sensor surfaces; and (f) selection of the parameters for the sensor-to-buoy data link.

3. Chemical Warfare Equipment and Materials

AD-606 041 Div. 3, 16
OTS Prices: HC $2.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
CRITERIA FOR CASUALTY PRODUCTION AND PRELIMINARY FLAME PATTERN ANALYSIS,
by J. A. Nickel and J. D. Palmer. 15 Sep 64, 40p
OURI-TM-1454-1-1
Contract DA18 035AMC116A, Proj. 1454
Unclassified report

Descriptors: (*Flamethrower fuels, Distribution), (*Chemical warfare casualties, Mathematical analysis), (*Flame warfare, Effectiveness), Flamethrowers, Fire bombs, Probability, Optimization, Drag.

The first part of the paper is directed towards investigating the distribution of casualty producing material from the dynamics of dispersion. Some of this information may prove useful in estabilishing theoretical upper bounds on the region of Lethality. The last part of the paper is concerned with an analytical model for flame distributions resulting from a bomb dispersed gel, and of a flamethrower as based on empirical data. This data will serve as a lower limit of desired effects since it is currently obtainable. A number of curves are included showing the area of the target covered as a function of the orientation of the strike relative to the target center. (Author)

AD-605 379 Div. 4
OTS Prices: HC $2.00/MF $0.50

Monsanto Research Corp., Dayton, Ohio.
GAS-LIQUID CHROMATOGRAPHIC FRACTION COLLECTING AIDS AND ANALYSIS OF ALKYL BROMIDES.
Rept. for Jul 63-Mar 64,
by William D. Ross, Richard L. Evers, James F. Moon, and J. E. Katon. Jul 64, 32p
Contract AF33 616 8465, Proj. 7360, Task 736005
ML-TDR64 188

Unclassified report

Descriptors: (*Chromatographic analysis, Laboratory equipment), (*Halogenated hydrocarbons, Chromatographic analysis), Bromides, Gases, Separation, Electrostatic precipitation.

Three modifications for improvement of fraction collection of eluates from the gas chromatograph were designed and built in the laboratory. They include an electrostatic precipitator, a heated chromatograph outlet, and a specialized glass fraction collector for transfer of liquid eluates to infrared cells. Drawings, schematics, and an evaluation of data are given. A gas chromatographic technique was developed for the analysis of sixteen alkyl bromides. Chromatograms and graphs are shown. (Author)

AD-605 410 Div. 4
OTS Prices: HC $5.00/MF $1.00

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
FAR INFRARED TORSIONAL AND BENDING VIBRATIONS OF TOLUENE AND ITS DERIVATIVES AND THE BARRIER HEIGHT TO INTERNAL ROTATION.
Rept. for Jun 63-Jun 64,
by William G. Fateley, Foil A. Miller, and Robert E. Witkowski. Jun 64, 188p
Contract AF33 657 11142, Proj. 7367, Task 736702
ML TDR64 158 pl

Unclassified report

Descriptors: (*Aromatic compounds, Spectra (Infrared)), (*Infrared spectroscopy, Aromatic compounds), Aldehydes, Organic nitrogen compounds, Halogen compounds, Chemical bonds, Vibration, Phase studies, Raman spectroscopy, Thermocouples.

The far infrared spectra of ortho-, meta-, and para-halogenated toluene; and butadiene- and glyoxal-type molecules was investigated. Torsional vibrations were assigned and barriers to internal rotation for methyl groups and C-C single bonds in conjugated systems have been calculated. Low bending frequencies in aromatic and acyclic conjugated molecules were observed and in some cases assigned to specific vibrational motion. Results are given on the shift in frequency resulting from changes from liquid to vapor phase. Band contours in the mid infrared region for aromatic compounds were studied in an attempt to distinguish molecules with free rotation of the methyl group. A performance comparison of Golay detectors to thermocouple is also reported. (Author)

AD-605 430 Div. 4, 8
OTS Prices: HC $1.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
EFFECTS OF IONIZING RADIATION ON PYRIDINE,
by Carol K. Pearce. Jul 64, 14p
Task 1A0 10501B01026
USAEL TR2485

Unclassified report

Descriptors: (*Pyridines, Radiation chemistry), (*Radiation chemistry, Pyridines), Liquids, Decomposition, Polymerization, Gases, Hydrogen, Polymers, Electronic equipment.

Irradiation of liquid pyridine was found to produce polypyridines, and hydrogen and acetylene gases. A mechanism is presented to explain the products and yields observed. Some conclusions related to the use of pyridine compounds for electronic devices are discussed. (Author)

AD-605 457 Div. 4, 25
OTS Prices: HC $4.00/MF $1.00

Johnston (William H.) Labs., Inc., Baltimore, Md.
BASIC STUDIES IN QUANTUM AND RADIATION CHEMISTRY.
Rept. for Dec 61-Jun 64,
by Marvin Vestal, M Krause, and Wm. H. Johnston. Jun 64, 135p
Contract AF33 616 7678, Proj. 7360, Task 736003
ML TDR64 169

Unclassified report

Descriptors: (*Radiation chemistry, Quantum mechanics), (*Quantum mechanics, Radiation chemistry), Gasionization, Photons, Electrons, X-rays, Atomic orbitals, Mass spectroscopy, Aliphatic compounds, Alcohols, Amines, Silanes, Hydrogen compounds, Sulfides, Hydrochloric acid, Argon, Methane, Ammonica, Water vapor, Neon, Thiols, Halogenated hydrocarbons, Krypton Carbon tetrachloride, Xenon, Mercury, Butane, Oxygen, Nitrogen.

The primary interactions of high energy photons and electrons with matter in the gas phase were studied. The experimental studies included measurements of the mass/charge spectra produced both by x-ray ionization and by high energy electron ionization, as well as secondary electron energy measurements for both x-ray and electron ionization. The molecules studied were the following: propane, ethanol, ethylamine, silane, hydrogen sulfide, hydrogen chloride, argon, methane, ammonia, water, neon, ethyl silane, ethanethiol, ethyl chloride, methyl chloride, methyl bromide, ethyl bromide, hydrogen bromide, krypton, methyl iodide, ethyl iodide, carbon tetrachloride, xenon, mercury, dimethylamine, 1, 3-butadiene, n-butane, 2-butyne, oxygen and nitrogen. The data obtained in these investigations are the first comprehensive measurements of inner shell ionization by x-rays in which the resulting mass/charge spectra were measured in a mass spectrometer. The theoretical interpretation and a semi-empirical correlation of the experimental data are discussed. (Author)

AD-605 559 Div. 4, 25
OTS Prices: HC $1.00/MF $0.50

Michigan Univ., Ann Arbor. Coll. of Literature, Science, and the Arts.
INFRARED STUDIES: STARK EFFECTS IN HCN, CH3F, CH3I, NH3 AND H2O; HINDERED ROTATION IN H2O2; INFRARED ABSORPTION OF MATRIX ISOLATED NH3.
Final rept.,
by Robert H. Hunt, Paul D. Maker, Robert E. Meredith, and C. W. Peters. Aug 64, 8p ORA-03640-4-F
Contract AF19 604 6125, Projs. 8603, 03640, Task 860301
AFCRL 64 668

Unclassified report

Descriptors: (*Infrared spectroscopy, Polyatomic molecules), (*Polyatomic molecules, Spectra (Infrared)), Abosorption spectrum, Hydrogen compounds, Cyanides, Halogenated hydrocarbons, Fluorides, Iodides, Ammonia, Water vapor, Hydrogen peroxide, Abstracting.

AD-605 287 Div. 4, 14
OTS Prices: HC $2.00/MF $0.50

Air Force Flight Dynamics Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
CARBON DIOXIDE MANAGEMENT. PART I: TECHNIQUE FOR CARBON DIOXIDE ABSORBER EVALUATION,
by John P. Allen. Jun 64, 44p
Proj. 6146, Task 614611
FDL TDR64 67 P1

Unclassified report

Descriptors: (*Carbon dioxide, Absorption), Lithium compounds, Potassium compounds, Sodium compounds, Hydroxides, Borates, Calcium compounds, Oxides, Ion exchange resins, Amines, Effectiveness, Test methods, Spacecraft cabins, Air, Purification.

A laboratory device was assembled for a closed air loop analysis of carbon dioxide removal agents. Lithium hydroxide, potassium hydroxide, soda lime, and molecular sieve 5A were used for establishing the adaptability and capability of this device for evaluation of other carbon dioxide removal agents. Carbon dioxide absorption curves from 1 percent and/or 5 percent carbon dioxide in laboratory air were obtained. Borax solution and amine solutions or solids showed some carbon dioxide removal capacity which will be further investigated for quantitative data on the removal process. (Author)

AD-605 314 Div. 4, 13
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center,
Redstone Arsenal, Ala.
ON THE QUANTITATIVE DETERMINATION OF PHENOLS SEPARATED BY THIN-LAYER CHROMATOGRAPHY,
by Helmut Seeboth and Hedda Gorsch. 27 Jul 64, 14p
RSIC 224; TT 64 71299

Unclassified report

Trans. of Chemische Technik (East Germany) 1963,
v. 15, no. 5, p. 294-296.

Descriptors: (*Wastes (Industrial), Chromatographic analysis), (*Phenols, Chromatographic analysis), Quantitative analysis, Colorimetric analysis, Adsorption, Separation, East Germany.

It is shown that a quantitative evaluation of phenols in industrial waste waters is possible through separation by means of thin-layer chromatography. The method is fast and simple, but its application is limited. The qualitative analysis of phenols through thin-layer chromatography can be used advantageously on a broader scale and is recommended for analyzing the most important phenols contained in waste waters. (Author)

AD-605 316 Div. 4
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
A GENERALIZED TECHNIQUE FOR ELIMINATING SPECIES IN COMPLEX CHEMICAL EQUILIBRIUM CALCULATIONS,
by N. Z. Shapiro. Sep 64, 32p RM-4205-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Chemical equilibrium, Mathematical analysis), Phase studies, Ionization, Thermochemistry, Vector analysis.

Consideration is given to multi- or single-phase chemical equilibrium problems, showing that, under certain circumstances, a problem involving a very large number of different chemical species may be replaced by one involving relatively few species. The new problem will then be much more amenable to numerical solution than the original problem.

AD-605 318 Div. 4, 10
OTS Prices: HC $0.50/MF $0.50

Naval Research Lab., Washington, D. C.
HYDROLYIS OF OIL-DISPERSED AMINE SALTS.
Interim rept.,
by M. A. Scheiman and H. R. Baker. 20 Jul 64, 14p
Proj. RR001 01 43 4752
NRL 6081

Unclassified report

Descriptors: (*Corrosion inhibition, Fuel additives), (*Fuel additives, Synthesis (Chemistry)), (*Amines, Hydrolysis), Stearates, Sulfonates, Acids, Salts, Chemical reactions, Containers, Oils.

The water insoluble reaction products between a series of amines and phenylstearic acid and dinonylnaphthalenesulfonic acid were chosen as structurally determinate prototypes of ashless 'salt' rust inhibitors. The stabilities of such additives dissolved in an organic phase in contact with aqueous phases of varying pH and CO2 content were investigated. Results were reported as percent hydrolysis, i.e., percent of nitrogen originally present in the organic phase that was found in the aqueous phase at the termination of the reaction. Salt stability depends on an acid displacement mechanism wherein a strong acid displaces the anion conjugate of weaker acid from its salt. The extent to which the amine component of the amine phenylstearate salts is extracted by water parallels the water solubility of the amine component. The effect is further enhanced by the presence of carbon dioxide. The amine component of the amine dinonylnaphthalene sulfonates is extracted by water only in trace amounts even in the presence of carbon dioxide. The presence of acids stronger than carbonic acid in the aqueous phase may result in complete destruction of the amine phenylstearate and in substantial depletion of amine from solutions of amine dinonylnaphthalene sulfonates. (Author)

AD-605 332 Div. 4
OTS Prices: HC $2.00/MF $0.50

Pennsalt Chemicals Corp., Philadelphia, Pa.
INORGANIC COORDINATION POLYMERS. VI. LINEAR DOUBLE-BRIDGED CHROMIUM(III) PHOSPHINATE POLYMERS WITH INORGANIC SIDE GROUPS.
Technical rept. no. 41,
by A. J. Saraceno and B. P. Block. Aug 64, 30p
Contract Nonr2687 00, Proj. NR356 408

Unclassified report

Descriptors: (*Polymers, Synthesis (Chemistry)), (*Metalorganic compounds, Polymers), Organic compounds, Organic phosphorus compounds, Chromium compounds, Complex compounds, Polymerization, Infrared spectroscopy, Viscosity, Solubility, Thermochemistry.

Evidence that metal carbonyls react with phosphinic acids to yield related polymers is presented. A more detailed presentation of the synthesis and properties of the polymers (Cr(H2O) (OH) (OPR1R2O)2)x where R1 and R2 are phenyl and/or methyl groups is given. Samples with molecular weights which appear to be considerably higher than the values observed for related systems were synthesized. These polymers display properties typical of linear polymers, even though an octahedral metal is involved in the backbone and no chelate rings are present as blocking groups. Finally, they are representative of a rather large number of polymers currently being studied.

mens. This cell has as one electrode a partly submerged rotating disk of the sample from which x-ray diffraction patterns are made as a portion of this electrode rotates out of the solution. The cell is designed to study electrochemical processes of widely varied nature including active material transformations in primary and secondary battery electrodes, electrolytic deposition and corrosion phenomena. To illustrate the application of the cell to electrochemical investigations, preliminary work shows that silver oxides can be identified on a working silver electrode in KOH solution. (Author)

AD-605 708 Div. 4, 7
OTS Prices: HC $1.00/MF $0.50

Naval Research Lab., Washington, D. C.
A STUDY OF ADSORPTION AND OXIDATION OF CARBON MONOXIDE ON PLATINUM USING CONSTANT-CURRENT PULSES,
Interim rept.,
by T. B. Warner and S. Schuldiner. 24 Apr 64, 11p
Projs. SR007 12 01 0809, RR001 01 43 4754
NRL 6058

Unclassified report

Descriptors: (*Fuel cells, Electrochemistry), (*Carbon compounds, Monoxides), Adsorption, Electrodes, Platinum, Surface properties, Electric currents, Oxidation, Chemisorption.

Using single anodic constant-current pulses, the steady-state concentration of both the carbon monoxide already adsorbed on the surface of a bright platinum electrode immersed in 1M H2SO4 and the additional amount of CO adsorbed during the application of the pulse was determined. At potentials of 0.3 to 0.4 v relative to the normal hydrogen electrode, a surface coverage of one CO molecule per surface Pt atom was observed at very low CO partial pressures; for CO partial pressures up to 1 atm, the coverage increased to about 1.06 CO molecules per Pt atom, indicating that additional CO physically adsorbs on the base chemisorbed layer. At 1.0 to 1.3 v the rate of adsorption of CO was slower than the rate of diffusion (at 25C), and indirect evidence suggests that CO is not adsorbed at potentials above 1.3 v. The mechanism of oxidation of CO appears to be an electrochemical oxidation of water to form chemisorbed oxygen atoms, which then rapidly react with chemisorbed CO to form CO2. (Author)

AD-605 711 Div. 4, 9
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia.
IONIZATION OF CESIUM AND SODIUM CONTAMINATED AIR IN THE HYPERSONIC SLENDER BODY BOUNDARY LAYER.
Technical information series,
by M. Lenard. Aug 64, 36p R64SD22

Unclassified report

Descriptors: (*Ablation, Gas ionization), (*Hypersonic flow, Gas ionization), (*Gas ionization, Impurities), Reentry vehicles, Conical bodies, Boundary layer, Plasma medium, Air, Cesium, Sodium, Nitrogen, Oxygen, Nitrogen compounds, Oxides, Ions, Chemical reactions, Electron density.

An approximate procedure is used to predict the effect on air ionization of small amounts of cesium and sodium in the ablating surface material of pointed cones. Ionization is assumed to occur due to finite rate gas phase chemical reactions in the laminar boundary layer. An 11 species (N2, O2, N, O, NO, Cs or Na, NO+, Cs+ or Na+, O2-, O-, e-) 16 reaction chemical system is assumed. (Author)

AD-605 723 Div. 4
OTS Prices: HC $3.00/MF $0.75

King's Coll., Univ. of London, Cambridge (England).
INFLUENCE OF IONIC SOLUTES UPON RELAXATION TIMES.
by V. Gold. Jul 64, 98p
Contract AF61 052 458
AFOSR 64 1605

Unclassified report

Descriptors: (*Nuclear magnetic resonance, Relaxation time), (*Nickel, Nuclear magnetic resonance), Spectrum analyzers, Design, Nuclear spins, Cyanides, Halides, Ketones, Butanols, Organic phosphorus compounds, Aldehydes, Pyruvates, Alcohols, Organic solvents, Complex compounds, Catalysis, Chemical bonds, Great Britain.

Sin-lattice relaxation times were measured by the 'direct' N,M,R. method for dilute aqueous solutions of Ni(II) in presence of cyanide, halide, acetone, t-butyl alcohol, trimethyl phosphate, edta and trien, for some of these solutes in the absence of paramagnetic ions. Spin-spin relaxation times were used to measure the influence of hydrogen ions on complex formation between water and acetaldehyde or pyruvic acid. Complex formation between methanol and other solvents through hydrogen-bonding was investigated by measurements of chemical shifts, the influence of methoxide ions on multiplet collapse, and indicator measurements. (Author)

AD-605 776 Div. 4, 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ANALYSIS BY MIGRATION IN THE PRESENCE OF CHEMICAL REACTION,
by Norman Shapiro. Jun 62, 20p P-2596

Unclassified report

Descriptors: (*Quantitative analysis, Mathematical analysis), (*Chemical reactions, Mathematical analysis), Differential equations, Partial differential equations, Vector analysis, Chromatographic analysis, Electrophoresis.

This paper presents a mathematical framework which will allow quantitative analysis techniques using molecule migration rate differences (such as electropohoresis, ultracentrifugation, countercurrent distribution, column or paper chromatography, various dilition techniques etc.) to be used even in the presence of non-negligible chemical reactions amongst the species.

AD-605 799 Div. 4, 8
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE THIRD CONCURRENCE OF THE ELECTRONIC TUBE,
by M. Rostarchuk. Aug 64, 8p
FTD TT64 366; TT 64 71376

Unclassified report

Unedited rough draft trans. from Sovetskaya Belorussiya (USSR) 1963, no. 55, 6 Mar, p. 4.

Descriptors: (*Electron tubes, Theory), (*Electrochemistry, Electronics), Diodes, Electrodes, Electrolytes, Cold cathode tubes, Transformers, Audiofrequency, Extremely low frequency, USSR, Electromagnetic waves.

Electro-chemical elements are discussed which may

AD-605 569 Div. 4, 25
OTS Prices: HC $2.00/MF $0.50

Cornell Univ., Ithaca, N. Y.
PHOTOIONIZATION OF THE 4d ELECTRONS IN XENON.
Technical rept. no. 11,
by D. L. Ederer. Sep 64, 32p
Contract Nonr401 37, Proj. NR017 625
Unclassified report

Descriptors: (*Xenon, Ionization), (*Photochemistry, Xenon), X rays, Radiation chemistry, Spectroscopy, Atomic orbitals, Atomic energy levels, Electrons.

AD-605 590 Div. 4, 22
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CATALYSIS OF REACTIONS IN SOLID PHASE,
by F. Shol'moshi and L. Reves. 12 Feb 64, 23p
FTD MT63 244; TT 64 71336
Unclassified report

Edited machine trans. of Kinetika i Kataliz (USSR) 1963, v. 4, no. 1, p. 88-96.

Descriptors: (*Catalysis, Reaction kinetics), (*Ammonium compounds, Perchlorates), (*Iron compounds, Oxides), Explosive materials, Propellants, Decomposition, Pyrolysis, Thermochemistry, USSR, Hungary.

The catalytical action of ferric oxide on different stages of disintegration of ammonium perchlorate, and also disintegration of pure ammonium perchlorate in the same conditions was studied. The addition of ferric oxide at 210-240C hardly affected the course of the reaction, but at 245-270C rendered significant catalytical action. Analysis of kinetic data leads to the conclusion that ferric oxide promotes acceleration of the process of transmission of electrons from anions to cations which is the controlling stage of the reaction. Ferric oxide also catalyzed the reaction of ammonium perchlorate at high temperature. (Author)

AD-605 675 Div. 4, 25
OTS Prices: HC $2.00/MF $0.50

California Inst. of Tecn., Pasadena.
NITROGEN-15 MAGNETIC RESONANCE SPECTROSCOPY. II. COUPLING CONSTANTS.
Technical rept. no. 31,
by Gerhard Binsch, Joseph B. Lambert, Bryan W. Roberts, and John D. Roberts. Aug 64, 38p
Contract Nonr220 26, Proj. NR055 388
Unclassified report

Descriptors: (*Nitrogen, Magnetic resonance), (*Atomic orbitals, Nitrogen), Chemical bonds, Carbon, Hydrogen, Nuclear spins, Organic nitrogen compounds, Spectroscopy.

Coupling constants were measured between nitrogen-15 and directly bonded hydrogen or carbon-13, and between nitrogen-15 and hydrogen separated by two or more bonds. The data may generally be interpreted in terms of the Fermi contact coupling mechanism except for those cases where the electron distribution around the nitrogen atom is highly anisotropic. (Author)

AD-605 676 Div. 4, 25
OTS Prices: HC $2.00/MF $0.50

California Inst. of Tech., Pasadena.
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: THE EFFECT OF SOLVENT ON MAGNETIC NON-EQUIVALENCE DUE TO MOLECULAR ASYMMETRY.
Technical rept. no. 32,
by George M. Whitesides, John J. Grocki, David Holtz, Herbert Steinberg, and John D. Roberts. Aug 64, 34p
Contract Nonr220 26, Proj. NR055 388
Unclassified report

Descriptors: (*Nuclear magnetic resonance, Molecular structure), (*Molecular structure, Nuclear magnetic resonance), Ethers, Aromatic compounds, Protons, Chemical bonds, Magnetic properties, Solvents.

The chemical shift between the geminal methylene protons of 1-phenylethyl benzyl ether was measured in a variety of solvents. An approximate correlation observed between solvent dielectric constant and the degree of the magnetic nonequivalence of the methylene protons is discussed in light of similar results for structurally related compounds. It is suggested that the variation in the magnetic nonequivalence with solvent may reflect changes in the conformation of the benzylic phenyl ring with respect to the methylene group. (Author)

AD-605 677 Div. 4, 25
OTS Prices: HC $1.00/MF $0.50

California Inst. of Tech., Pasadena.
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: ANALYSIS OF THE PROTON SPECTRUM OF CYCLOBUTENE.
Technical rept. no. 33,
by Stanko Borcic and John D. Roberts. Aug 64, 18p
Contract Nonr220 26, Proj. NR055 388
Unclassified report

Descriptors: (*Cyclobutenes, Nuclear magnetic resonance), (*Nuclear magnetic resonance, Cyclobutenes), Protons, Chemical structure, Chemical bonds, Deuterated compounds, Spectroscopy.

A complete analysis of the proton n.m.r. spectrum of cyclobutene (I) was made which shows that the couplings between the allylic and vinylic protons, while small, are by no means negligible. The analysis which involved C(13)-satellite spectra of ordinary and specifically deuterated cyclobutene gave spin-coupling and chemical shift parameters which predict that cyclobutene should show just two quite sharp peaks in its high-resolution n.m.r. spectrum in agreement with experiment. (Author)

AD-605 707 Div. 4, 7, 25
OTS Prices: HC $1.00/MF $0.50

Naval Research Lab., Washington, D. C.
ELECTROLYTIC CELL FOR X-RAY DIFFRACTION STUDIES OF ELECTRODE PHENOMENA.
Interim rept.,
by C. P. Wales and Jeanne Burbank. 2 Mar 64, 17p
Projs. RR001 01 43 4755, SF013 06 03 4366
NRL 6050
Unclassified report

Descriptors: (*Electrolytic cells, Design), (*Electrodes, X-ray diffraction analysis), (*X-ray diffraction analysis, Electrolytic cells), Electrochemistry, Batteries and components, Transformations, Electrodeposition, Corrosion, Silver compounds, Oxides, Electrolytes, Potassium compounds, Hydroxides.

An electrolytic cell was designed for use on a horizontal circle x-ray spectrogoniometer to permit simultaneous diffraction and electrochemical study of electrode speci-

Edited machine trans. of Khimiya i Tekhnologiya Topliv i Masel (USSR) 1963 v. 8 no. 9, p. 31-38.

Descriptors: (*Oils, Chemical properties), (*Petroleum, Chemical analysis), Distillation, Aliphatic compounds, Aromatic compounds, Monocyclic compounds, Organic sulfur compounds, Density, Refractive index, Molecular weight, Viscosity, Oxidation, Stability, Turbines, USSR.

AD-605 909 Div. 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
STUDY OF ELECTROPHORETIC MOBILITY OF COLLOIDAL PARTICLES BY METHOD OF DISLOCATION OF BOUNDARIES,
by Arvind Kumar and Abani K. Bhattacharya.
30 Mar 64, 12p
FTD MT63 263; TT 64 71386

Unclassified report

Edited machine trans. of Kolloidnyi Zhurnal (USSR) 1963, v. 25, no. 3, p. 329-333.

Descriptors: (*Colloids, Electrophoresis), (*Electrophoresis, Colloids), Electrolytes, Lithium compounds, Sodium compounds, Barium compounds, Chlorides, Electrodialysis, Gels, Iron compounds, Hydroxides, Electrical conductance, USSR, India.

The cataphoretic velocity of the sol Fe(OH)3 was studied at various stages of dialysis with use of different chlorides of identical electrical conductivity as auxiliary liquids. (Author)

AD-605 919 Div. 4, 16, 25
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
MASS ACTION LAWS AND THE GIBBS FREE ENERGY FUNCTION,
by N. Z. Shapiro and L. S. Shapley. Sep 64, 61p
RM-3935-1PR, RM-3935-PR, rev.
Contract AF49 638 700
AD 426 718 rev.

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Chemical equilibrium, Mathematical analysis), Scientific research, Biology, Physiology, Chemical reactions, Temperature, Pathology, Mathematical models, Quantitative analysis, Algebra, Functions, Programming (Computers), Potential theory.

Recent progress in computational techniques for the analysis of complex chemical systems has renewed interest in the relationship between the mass action laws, which have been traditionally employed for the computation of chemical equilibrium compositions, and the Gibbs free energy function, which until recently has generally been used only for theoretical purposes. Several attendant mathematical questions, hitherto unresolved, have now become important. These concern the existence and uniqueness of a solution to the equations arising from the mass action laws; the existence and uniqueness of a composition that minimizes the free energy; and the precise relationship between the two. In Part 1, the problems are formulated, both from the mathematical and chemical viewpoints. In Part 2, mathematical tools unavailable in Gibbs' time are employed in an attempt to answer the questions posed. Some applications of the results are given in the concluding section for illustrative purposes.

AD-605 922 Div. 4, 7
OTS Prices: HC $1.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
ANALYTICAL METHODS TO STUDY KINETICS OF FERMENTATION,
by John A. Christopulos. Jun 64, 18p
Task 1G6 22001A053 04
USAEL TR2483

Unclassified report

Descriptors: (*Fuel cells, Biochemistry), (*Alcohols, Volumetric analysis), (*Glucose, Volumetric analysis), Enzymes, Reaction kinetics, Buffers, Yeast, Chemical precipitation, Lead compounds, Acetates, Molecular rotation, Potassium compounds, Chromates, Distillation.

The volumetric determination of ethanol in the presence of glucose, buffer salts, and yeast requires a special analytical technique similar to that for determining alcohol in blood devised by Harger. In the special technique as described in this report the yeast cells, which would chemically interfere with the volumetric determination, are flocculated with lead acetate followed by centrifugation (greater than 2800 RPM). The clarified samples (4-6 ml) were found to be yeast-free and ready for subsequent glucose and ethanol determination. The glucose rest concentration of clarified samples was then determined by measurement of the optical rotation with a polarimeter. Knowing this rest concentration of glucose and its stoichiometric equivalent of dichromate, a correction factor was calculated. This correction factor was then used in the oxidimetric determination of ethanol. The oxidimetric titration for determination of ethanol was performed with potassium dichromate. (Author)

AD-605 932 Div. 4, 17
OTS Prices: HC $2.00/MF $0.50

Army Frankford Arsenal, Philadelphia, Pa.
DETERMINATION OF IRON, NICKEL, COPPER, AND COBALT IN TUNGSTEN AND TUNGSTEN ALLOYS,
by George Norwitz and Herman Gordon. Aug 64, 30p
Proj. 4 4930 1 03
AFA T65 1 1

Unclassified report

Descriptors: (*Tungsten, Chemical analysis), (*Tungsten alloys, Chemical analysis), (*Chemical analysis, Metals), Iron, Nickel, Copper, Cobalt, Volumetric analysis, Spectrophotometers, Gravimetric analysis, Optical analysis, Test methods.

Iron, nickel, copper, and cobalt in tungsten and tungsten alloys are analyzed spectrophotometrically by taking aliquots of a hydrofluoricnitric acid solution that has been buffered to a pH of 6 by the addition of ammonium tartrate and sodium borate. No subsequent adjustment of pH is necessary for the spectrophotometric determination of the iron, copper, or cobalt. The iron is determined with ortho-phenanthroline, the nickel with dimethylglyoxime (using an ammoniacal medium for trace amounts and an ammoniacal-sodium hydroxide medium for large amounts), the copper with neocuproine, and the cobalt with nitroso-R salt. Large amounts of iron are determined titrimetrically after sodium hydroxide and ammonium hydroxide precipitations. A direct method for the gravimetric determination of large amounts of nickel in tungsten with dimethylglyoxime by use of the ammonium tartrate-sodium fluoborate buffer system is described. Copper is determined electrolytically after dissolution in hydrofluoric and nitric acids and addition of hydrogen peroxide. Large amounts of cobalt are determined potentiometrically with potassium ferricyanide. (Author)

replace the entire scheme of things based on electronic equipment; and this in spite of the fact that in many cases this new equipment has somewhat larger dimensions than the semi-conductor variety, as schematics for these devices will all be more easily and more economically produced than those for electronic tubes.

AD-605 800 Div. 4, 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COMPARATIVE CHARACTERISTICS OF THE SPECTROPHOTOMETRIC METHODS OF IDENTIFYING TANTALUM AND NIOBIUM. II. APPLICATION OF ORGANIC REAGENTS,
by A. T. Pilipenko and O. M. Eremenko.
27 Aug 64, 18p
FTD TT64 455; TT 64 71377

Unclassified report

Unedited rough draft trans. of Ukrainskii Khimicheskii Zhurnal (USSR) 1963, v. 29, no. 5, p. 538-547.

Descriptors: (*Tantalum, Absorption spectrum), (*Niobium, Absorption spectrum), (*Absorption spectrum, Chemical analysis), Organic compounds, Titanium, Thiocyanates, Dyes, Tantalum compounds, Niobium compounds, USSR.

Studies were made of the absorption spectra of niobium and tantalum compounds which were used for the spectrophotometric identification of them. The inhibiting effect of several elements, which are associated with tantalum and niobium, was studied. According to the methods considered, it appears that the best one for the identification of niobium is the extractive thiocyanate method, and for the identification of tantalum -- the extractive method with the application of methyl violet. (Author)

AD-605 801 Div. 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
QUANTITATIVE DETERMINATION OF DOUBLE BONDS IN UNSATURATED SILICO-ORGANIC COMPOUNDS BY SPECTRAL ADSORPTION IN THE INFRARED REGION,
by Yu. Ya. Mikhailenko, L. P. Senetskaya, and E. G. Kutyrina. 27 Aug 64, 10p
FTD TT64 458; TT 64 71378

Unclassified report

Unedited rough draft trans. of Akademiya Nauk SSSR. Komissiya po Analiticheskoi Khimii. Trudy, 1963, v. 13(16) p. 383-388.

Descriptors: (*Silanes, Quantitative analysis), (*Siloxanes, Quantitative analysis), Silicon compounds, Organic compounds, Infrared spectroscopy, Absorption spectrum, Chemical bonds, Solvents, USSR.

A procedure is described for detecting divinyl-tetraethoxy-disiloxane (CH2 = CH)2 -- (C2H5O)4 Si2O and vinyl-triethoxysilane CH2 = CH -- Si (OC2H5)3, both in a solution of carbon disulfide.

AD-605 809 Div. 4, 7
OTS Prices: HC $4.00/MF $0.75

Baylor Univ., Waco, Tex.
AN INVESTIGATION OF THE MECHANISM OF ELECTROLYTIC OXIDATION OF ORGANIC COMPOUNDS AND OF COMPETITIVE PROCESSES INVOLVING HYDROGEN AT THE SURFACE OF THE SOLID METAL ELECTRODES.
Final rept.,
by Thomas C. Franklin, Nellie F. Franklin, Charles Liang, Fujio Matsuda, and Donald McClelland.
Jun 64, 114p
Contract AF19 604 8414, Proj. 6694, Task 669406
AFCRL 64 517

Unclassified report

Prepared in cooperation with the Robert A. Welch Foundation.

Descriptors: (*Fuel cells, Electrochemistry), (*Electrodes, Chemical reactions), Platinum compounds, Hydroxides, Oxidation, Organic compounds, Adsorption, Catalysis, Hydrogen peroxide, Formaldehyde, Alcohols, Quinones, Hydrogen, Absorption, Chemical equilibrium, Iron, Palladium, Titanium, Metal coatings, Impurities, Water, Hydrochloric acid, Electrical double layer.

A study was made of the electrode processes for the oxidation of some low molecular weight organic compounds at platinum electrodes in 2N sulfuric acid and 2N sodium hydroxide solutions. A new method for studying the kinetic order of electrode reactions was used. It was concluded that the oxidation of the organic compounds at platinum electrodes is chemical in nature and that there are two products produced in the electrochemical reactions and these products in turn react with the organic compounds. It was postulated that these products are PtOH and Pt (OH)2. A coulometric technique using a polarograph was used to study the sorption of hydrogen at iron electrodes. This technique indicated that there was one form of hydrogen on the surface of the electrode, and that there were two forms of hydrogen absorbed in the electrode. The effects of solution additives on hydrogen absorption by iron were also studied. (Author)

AD-605 864 Div. 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NEW METHODS OF INORGANIC SYNTHESIS,
by V. I. Mikheeva. 25 Mar 64, 16p
FTD MT64 96; TT 64 71390

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Vestnik, 1963, v. 33, no. 5, p. 34-39.

Descriptors: (*Inorganic compounds, Synthesis (Chemistry)), Hydrides, Boron compounds, Perchlorates, Fluorine compounds, Chemical reactions, Theory, Laboratory equipment, Reviews, USSR.

Contemporary advances in the synthesis of metal hydrides, boron compounds, perchlorates, and inorganic fluorine compounds are discussed, and progress in inorganic theory and laboratory technique is mentioned.

AD-605 902 Div. 4, 10, 14
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE COMPOSITION AND PROPERTIES OF A TURBINE DISTILLATE OF TUYMAZY OIL,
by N. G. Kalantar, V. I. Glazunov, and V. S. Mannafova.
17 Mar 64, 20p
FTD MT63 241; TT 64 71423

Unclassified report

Descriptors: (*Polymers, Pyrolysis), Polycyclic compounds, Chemical bonds, Degradation, Models (Simulations), Monte Carlo method, Theory, Programming (Computers).

The random thermal degradation of four- and six-membered ring ladder polymers were investigated and results compared to a single chain polymer undergoing degradation under the identical conditions. The change in molecular weight versus time was plotted and significant differences were found in the shapes of the curves. Similar studies were conducted with imperfect ladder polymers which had single bonds along the backbone of the polymer. (Author)

AD-606 075 Div. 4
OTS Prices: HC $1.00/MF $0.50

Rochester Univ., N. Y.
THE PRIMARY PHOTOCHEMICAL PROCESS IN COMPLEX MOLECULES AND THE REACTIONS OF CERTAIN RADICALS.
Final rept. for 1 Feb 63-1 Aug 64,
by W. Albert Noyes, Jr. 1 Aug 64, 7p
Grant AF AFOSR206 63
AFOSR 64 1688
Unclassified report

Descriptors: (*Photochemistry, Molecular properties), (*Free radicals, Chemical reactions), Low-temperature research, Aromatic compounds, Atomic energy levels, Electron transitions, Ketones, Dissociation.

Work in the following areas is summarized: behavior of excited singlet and triplet states of several molecules; reactions of triplet states; photochemistry of certain molecules including reactions of radicals. A bibliography of papers published under the grant is given.

AD-606 103 Div. 4
OTS Prices: HC $2.00/MF $0.50

Research Inst., Temple Univ., Philadelphia, Pa.
ADDITION AND SUBSTITUTION PRODUCTS OF OXYGEN FLUORIDES.
Annual progress rept. no. 1, 1 Jan-31 Dec 60,
by A. G. Streng and A. V. Grosse. 3 Jan 61, 48p
Contract Nonr3085 01
Unclassified report

A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Oxygen compounds, Fluorides), (*Fluorides, Oxygen compounds), Synthesis (Chemistry), Chemical reactions, Substitution reactions, Chemical properties, Adsorption spectrum, Ozonides, Laboratory equipment, Oxidizers.

Work in the following areas is reported: synthesis and characterization of the oxygen fluorides; synthesis and characterization of certain substitution and addition products of the oxygen fluorides.

AD-606 146 Div. 4, 15
OTS Prices: HC $1.00/MF $0.50

Brandeis Univ., Waltham, Mass.
LOWER BOUNDS FOR THE HELMHOLTZ FUNCTION.
Technical rept. no. 10,
by Sidney Golden. 15 Sep 64, 10p
Contract Nonr1677 01, Proj. NR051 362
Unclassified report

Descriptors: (*Chemical equilibrium, Mathematical analysis), (*Special functions (Mathematical), Quantum mechanics), Quantum statistics, Thermodynamics, Energy, Potential theory, Operators (Mathematics), Calculus of variations, Hamiltonian, Equations of state, Matrix algebra.

A mathematical theorem is established for traces of products of bounded Hermitian and definiteoperators. This theorem is applied to the equilibrium partition function by exploiting an infinite product representation of the exponential function of the sum of two operators. As a result, a set of inequalities is established which yields a set of upper bonds for the partition function. This result is invariant to the particle statistics of the system. A general argument yields the result that the classical Helmholtz free energy function serves as a lower bound to the corresponding quantum result. (Author)

AD-605 938 Div. 4
OTS Prices: HC $6.00/MF $1.25

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN SALT DATA. ELECTRICAL CONDUCTANCE, DENSITY, AND VISCOSITY.
Technical rept.,
by George J. Janz, Anthony T. Ward, and Roger D. Reeves.
Jul 64, 204p
Grant AF AFOSR181 63
AFOSR 64 0039

Unclassified report

Descriptors: (*Salts, Physical properties), Electrical conductance, Density, Viscosity, Electrolytes, Fluorides, Chlorides, Bromides, Iodides, Oxides, Sulphates, Nitrates, Carbonates, Mixtures, Tables, Data.

Conductance, density, and viscosity data at round values of temperature (K) are given for some 126 inorganic compounds as single-salt melts (fluorides, 15; chlorides, 34; bromides, 20; iodides, 23; oxides, 7; sulphates, 5; nitrates, 7; carbonates, 3; and miscellaneous, 12). Equations expressing the temperature dependence of these properties for the single-salt melts are also given. For mixtures of these salts, the binary systems that have received attention are listed; numerical values for these mixtures are not given but are referenced. (Author)

AD-606 049 Div. 4, 25, 30
OTS Prices: HC $2.00/MF $0.50

Kem-Tech Labs., Inc., Baton Rouge, La.
ATOMIC ABSORPTION SPECTROSCOPY.
Final rept.
Apr 63, 48p
Contract AF30 602 2426, Proj. 5534, Task 553402
RADC TDR63 209

Unclassified report

Descriptors: (*Atomic spectroscopy, Chemical analysis), (*Chemical analysis, Atomic spectroscopy), Quantitative analysis, Absorption spectrum, Aluminum, Calcuim, Fluorides, Lead, Sulfates, Copper, Magnesium, Spectrophotometers, Bibliographies.

The report presents a discussion on the final instrumentation developed at Kem-Tech Laboratories. The detailed use of the instrument in actual analysis is described. Procedures and working curves are presented for aluminum, calcium, fluoride, lead, sulfate, copper, and magnesium. A list of 236 references is included. (Author)

AD-606 057 Div. 4, 25
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
RADICAL-MATRIX INTERACTIONS IN LOW TEMPERATURE GLASSES: PHOTO-REVERSIBILITY,
by S. Siegel and H. S. Judeikis. 1 Sep 64, 41p
TDR-269(4240-30)-8
Contract AF04 695 269
SSD TDR64 110

Unclassified report

Descriptors: (*Photochemistry, Free radicals), (*Free radicals, Photochemistry), Ethers, Alcohols, Glass, Ultraviolet radiation, Low-temperature research, Solvents, Impurities, Nuclear paramagnetic resonance, Line spectrum, Reaction kinetics, Oxygen, Molecular properties.

The near UV irradiation of ether and/or ethanol glasses at low temperatures (100 ± 25K) leads to the formation of trapped ethyl radicals via an excited impurity-solvent interaction. The radicals were observed by electron paramagnetic resonance spectroscopy (EPR), both during the irradiation and during the post irradiation period. The EPR spectral line shapes of the ethyl radicals changed as a function of time after light extinction and also of temperature during irradiation. Qualitative kinetics of the spectral changes were examined in some detail. In the absence of dissolved oxygen the spectral line shape changes are reversible upon re-irradiation; in the presence of oxygen the ethyl radical is irreversibly converted into the RO2 radical at temperatures where the oxygen can appreciably diffuse. The orgins of the spectral changes are discussed in terms of hindered rotational motions and localized phase changes, as well as the postulation of a possible charge transfer complex formation. Photo-reversibility is assumed to occur via radiationless transitions involving excited states of the impurities. (Author)

AD-606 060 Div. 4, 16
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center,
Redstone Arsenal, Ala.
STUDY OF THE HYDRATION OF PROTEINS BY THERMOGRAVIMETRY,
by Clement Duval and Ladislas Robert. 3 Sep 64, 6p
RSIC 260; TT 64 71437

Unclassified report

Trans. of Academie des Sciences, Paris. Comptes Rendus (France) 1954, v. 238, p. 282-284 (pub. by Gauthier-Villars et Cie., Paris).

Descriptors: (*Proteins, Thermochemistry), (*Thermochemistry, Proteins), Gravimetric analysis, Acetals, Aldehydes, Polymers, Casein, Gelatins, Fibrins, Albumins, Protamines, Nylon, Temperature, Kinetic theory, Weight, Dehydration, Hysteresis, Thermodynamics.

Thermogravimetric investigation was conducted by continuous or isothermal heating of various proteins (treated or not treated with acetaldehyde) and high polymers (casein, gelatin, fibrin, edestin, bovine serum albumin, protamin, hylon, rilsan). The study of the affinity of proteins (and, in general, of high polymers) for water is capable of furnishing useful data on the number and arrangement of polar groups, as has been shown by Bull, Pauling and others. In addition, the dry weight of solutions of pure proteins is one of the characteristics most frequently measured with a view of determining the concentration. However, Bull has shown in his now classic paper that the dry weight of a protein is far from being independent of the temperature and duration of heating. By studying the weights of proteins after maintaining them for two hours at different temperatures (between 80 and 137 degrees), this author arrives at the conclusion that there is no temperature at which a constant weight may be obtained. This statement is not entirely justified, since a kinetic study of the weight at different temperatures does not seem to have been carried out. The thermobalance is the instrument of choice for such a study, since it makes it possible to carry out weight recordings at constant temperatures of long duration.

AD-606 065 Div. 4, 14
OTS Prices: HC $3.00/MF $0.75

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
THEORETICAL STUDIES ON THE THERMAL DEGRADATION OF LADDER POLYMERS.
Rept. for Jan-Dec 63,
by Martin M. Tessler. Jul 64, 74p
Proj. 7342, Task 734203
ML TDR64 151

Unclassified report

AD-605 933 Div. 5, 8, 12, 30
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A SURVEY OF LOW NOISE RECEIVERS IN THE 350-MC TO 400-MC RANGE,
by R. C. Ward. 14 Nov 58 18p STL-GM-TN-0165-00196

Unclassified report

Descriptors: (*Radio receivers, Space communication systems), (*Space communication systems, Radio receivers), Space probes, Spaceborne, Ultrahigh frequency, Noise (Radio), Amplifiers, Transistors, Electron tubes, Masers, Parametric amplifiers, Ground support equipment.

Several types of UHF receivers considered for use in space probes and in ground-based equipment designed to receive signals from space probes are described. This comparison is made to present a guide for system design of probe-borne receiving equipment whose components are likely to be selected largely on the basis of noise characteristics, weight, and power consumption. Only configurations suitable for probe-borne service are considered.

AD-606 012 Div. 5, 30
OTS Prices: HC $2.00/MF $0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
MAGNETIC TAPE REHABILITATION STUDY,
15 Jan 62, 40p LMSC-A082365, SS-T62-4
Contract AF04 647 788 Unclassified report

Descriptors: (*Magnetic tape, Degaussing), Films, Plastics, Binders, Magnetic materials, Storage, Degradation, Magnetic recording systems, Computer storage devices.

The study was initiated to investigate the merit of using degaussed magnetic tape for data recording. Degaussing is not a problem, but serious problems do exist in evaluating the suitability of a given roll of tape for re-use, and in the conservation of tapes if the present practice of using only 'virgin' tape for primary data recording is modified to permit the use of degaussed, cleaned, and inspected tape. conservation includes, among others, such problems as: the adjustment of recording equipment; the manner in which the tape is wound before being placed in storge; the conditions of shipment and storage; duplication of recordings and redundant storage; and development of criteria of tape recycling limitations where at present these criteria are lacking or doubtful. The report discusses the conservation problems and suggests approaches to their solution.

5. Communications

AD-605 145 Div. 5, 18, 30
OTS Prices: HC $6.00/MF $1.25

ITT Communication Systems, Inc., Paramus, N. J.
DESCRIPTION OF THE DCS. SIMULATION OF THE DEFENSE COMMUNICATION SYSTEM.
20 Jun 63, 206p ICS-63-TR-193
Contract SD99, Task 1

Unclassified report

Descriptors: (*Communication systems, Defense systems), (*Defense systems, Simulation), Digital computers, Programming (Computers), Trafficability, Teletype systems, Punched tape, Circuits, Networks, Radio communication systems, Control systems, Operation, Performance (Engineering), Statistical analysis, Configuration.

This book provides a comprehensive functional description of the Defense Communications System, hereinafter abbreviated as DCS. The description of the DCS and analysis of the system operation constitute a specification for formulation of computer program design plans. The function and operations of various types of DCS switching centers are examined in detail, with particular emphasis on the store and forward switching systems. Both manual torn tape and automated switching methods are described from the standpoint of a computer simulation model. Among the automatic store and forward switching systems included here are the AN/FGC-30, the Plan 55, and the 82B1. In the area of circuit switching, the manual ringdown, common control and step by step methods are discussed and illustrated by message flow charts and time phase charts. This document does not compare switching systems or discuss their mechanical features, since it is not concerned with details of equipment design. The approach illustrates, through logic and message flow diagrams, the functioning of the various nodes with special attention to the points where queues are to be expected. (Author)

AD-605 275 Div. 5, 16, 30
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
AREA PROPERTIES OF TELEVISION PICTURES.
Physical sciences research papers,
by S. Nishikawa, R. J. Massa, and J. C. Mott-Smith.
Jun 64, 22p
Proj. 4610
AFCRL 64 478; AFCRL PSRP23

Unclassified report

Descriptors: (*Television display systems, Images), (*Video signals, Brightness), Statistical analysis, Probability, Statistical distribution, Bandwidth, Narrowbank, Analog computers, Analog-to-digital converters, Television converters, Measurement.

Area size distributions are measured for four different still pictures formed of 510 x 512 elements linearly quantized to eight amplitude levels (3 bits). The initial results of this continuing measurement program indicate that for the measured pictures: (1) First order brightness distributions tend to be uniform; (2) the largest number of areas occur for the intermediate grey levels, with considerably fewer areas encountered at either black or white; (3) the average size of black or white areas is larger than for the intermediate greys; (4) black and white areas appear to be more simply connected than intermediate grey areas; (5) the frequency of occurrence of areas of size n-elements falls off with n a little slower than 1/sq n; (6) the area size distributions for each picture appear quite similar; the greatest difference between them are in the area size range 20-200 elements, and in the presence or absence of one or two very large areas. From the data reported it is concluded that at least half of the discrete brightness areas in the picture have doubtful visual significance. (Author)

AD-605 319 Div. 5, 25
OTS Prices: HC $4.00/MF $0.75

Technical Operations, Inc., Burlington, Mass.
INVESTIGATION OF COHERENT OPTICAL PROPAGATION. Final rept.
by T. J. Skinner and R. E. Whitney. Aug 64, 102p
Contract AF30 602 2619, Proj. 4519, Task 451905
RADC TDR64 65

Unclassified report

Descriptors: (*Lasers, Light transmission), (*Light signals, Propagation), (*Light communication systems, Lasers), Waveguides, Optical equipment components, Waveguide bends, Alignment, Flexible couplings, Prisms (Optics).

The report discusses the guided propagation of an optical signal. The beam-waveguide was chosen for consideration because of its extremely low intrinsic loss. These intrinsic losses, along with misalignment and feed losses, are derived. The misalignment losses are high. To reduce them, a flexible joint was designed that allows the guide to flex without introducing prohibitive losses. Although much work remains to be done before a practical optical waveguide for long paths exists, the report demonstrates the feasibility of the beam-waveguide. (Author)

AD-605 891 Div. 5, 8, 12, 29
OTS Prices: HC $4.00/MF $0.75

CBS Labs., Stamford, Conn.
PERSONNEL COMMUNICATIONS IN SPACE. A STUDY OF SPEECH TRANSMISSION AND HELMET COMFORT.
Rept. for Jan 63-Jun 64,
by Benjamin B. Bauer, Alfred L. DiMattia, and Allan J. Rosenheck. Sep 64, 106p CLD-1707
Contract AF33 657 10737, Projs. 4335, 5228, Task 433506
AL TDR64 175

Unclassified report

Descriptors: (*Helmets, Voice communication systems), (*Voice communication systems, Space flight), (*Space communication systems, Speech transmission), Transducers, Microphones, Acoustic insulation, Noise, Psychoacoustics, Environmental tests, Experimental data, Design, Thermal insulation.

A program exploring original techniques as well as those currently employed was performed to improve speech communication and comfort tolerance in the space helmets. A high performance noise-cancelling microphone, the M-93, was investigated. Its superior characteristics were confirmed by psycho-acoustic comparisons with the M-87 and M-101 operational types. A study of microphone arrays was made. A unique space helmet was developed providing freedom of lateral head motion and featuring off-the-head transducers in its communication system. These features make possible predicted long comfort tolerance compared with presently used helmets. The new helmet additionally offers the excellent promise of significant noise reduction, good thermal insulation, and acoustic stability with comfortable sidetone level. A novel method of restoring aural directional perception to a man in space was further developed utilizing cardoid receptors and a specialized network. This method provided an important degree of orientation ability. Conclusions and recommendations for future work are included. (Author)

Rept. no. 2,
by B. A. Benn and C. C. Freeny. Jun 64, 77p
FZE-222-2
Contract AF30 602 2831, Proj. 6503
RADC TDR64 380

Unclassified report

Descriptors: (*Radar signals, Polarization), (*Radar targets, Scattering), Test facilities, Calibration, Feasibility studies, Antenna feeds, Helical antennas, Radar reflections, Phase measurement.

The report contains a description of the results of experiments performed at the RAT SCAT Site, a ground plane radar cross section range, to examine the operational feasibility of measuring arbitrary targets with circular polarization and, in addition, measuring linear scattering matrices. A calibration procedure compatible with the RAT SCAT facility is presented. Elliptical polarization was used to facilitate the establishment of circular polarization at the target point. Experimental data is presented on the magnitude of polarization degradation as a function of target size and time. Relative phase measurements, along with the necessary amplitude measurements, were used to determine the linear scattering matrix of a complex target. Finally, two annotated schemes compatible with present RAT SCAT equipment for obtaining the linear scattering matrix are described. (Author)

AD-605 628 Div. 6, 12, 24
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Service, Ottawa (Canada).
OPTICAL OBSERVATIONS OF ARTIFICIAL EARTH-SATELLITES,
by I. S. Shklovskii and P. V. Shcheglov. Jun 58, 12p
NRC-C-2728
DSIS T297R; TT 64 71369

Unclassified report

Trans. of Uspekhi Fizicheskikh Nauk (USSR) 1958, v. 64, no. 3, p. 417-424.

Descriptors: (*Satellites (Artificial), Optical tracking), (*Optical tracking, Satellites (Artificial)), Earth, Position finding, High-speed photography, Camera controls, Tracking telescopes, Photographic techniques, USSR.

This paper deals with the optical methods of determining and timing positions of artificial earth-satellites in space, by observation from the surface of the earth. Precise positions of an artificial satellite are essential for the calculation of its orbit, and on the basis of such data, it is possible to derive important information on the physical properties of the upper strata of the terrestrial atmosphere. With sufficiently precise orbital parameters it is possible to find the distribution of densities in the upper strata of the terrestrial atmosphere. It is also possible to investigate tidal effects in the high atmospheric strata.

AD-605 696 Div. 6, 12, 24
OTS Prices: HC $2.00/MF $0.50

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TRACKING TELESCOPE FUNDAMENTALS,
by James B. Edson. 23 Aug 48, 32p
Proj. TB3 0538B
BRL 672; PB 144 803

Unclassified report

Descriptors: (*Tracking telescopes, Operation), (*Guided missile tracking systems, Telescopes), Instrumentation, Brightness, Resolution, Visibility, Photographic techniques, Optical tracking, Photographic emulsions, High-speed photography, Design, Tracking.

This report assembles a foundation of simple basic information useful in the design and operation of tracking telescopes. Some topics discussed are: Appearance of the missile compared to planets; conditions for optimum missile visibility; telescope size requirements; effects of the atmosphere; station site selection; tracking and photographic techniques. Construction and installation at White Sands Proving Ground of the first tracking telescope is described. (Author)

AD-605 698 Div. 6, 2
OTS Prices: HC $1.00/MF $0.50

Smyth Research Associates, San Diego, Calif.
TARGET ACCURACY EXPERIMENT.
Monthly progress rept. for Jul 61,
by L. R. Hughes. Aug 61, 3p SRA-214
Contract AF30 602 2084

Unclassified report

Descriptors: (*Radio astronomy, Targets), (*Space surveillance systems, Targets), Radio receivers, Antennas, Navigation satellites, Stars, Extraterrestrial radio waves, Atmospheric refraction.

The necessary modifications to the receivers and antennas were made in order that radio star signals from the Cygnus A source and the Transit 4A satellite could be recorded. The Point Buchon field station is being operated currently and data are being collected. (Author)

AD-605 765 Div. 6, 8, 25
OTS Prices: HC $2.00/MF $0.50

Raytheon Co., Wayland, Mass.
A NEW TECHNIQUE FOR SIMULTANEOUS RADAR OBSERVATION OF MULTIPLE TARGETS WITHIN A BROAD SURVEILLANCE REGION.
Scientific rept. no. 2,
by Robert C. Distler and Frank A. Feldman.
31 Dec 63, 36p
Contract AF19 628 361, Proj. 4600, Task 460006
AFCRL 64 696

Unclassified report

Descriptors: (*Radar, Miltipath transmission), (*Radar tracking, Multiple operation), (*Transducers, Miltipath radar), Detection, Antennas, Optics, Acoustics, Phase shifters, Theory, Doppler effect, Target position indicators, Design, Lasers, Ultrasonic radiation, Mercury lamps, Coupling circuits, Multiple beam antennas, Display system, Radar scanning.

A new technique which permits simultaneous observation of multiple radar targets throughout a large volume of space has been investigated. In effect, this technique performs a transformation of the real target space into an analogous model space which is directly observable and which preserves the quantitative details of the target parameters. This report presents the results of experimental and theoretical investigations into this technique. A preliminary design of system components is presented and evaluated. (Author)

AD-605 766 Div. 6, 8, 12
OTS Prices: HC $3.00/MF $0.75

General Dynamics/Astronautics, San Diego, Calif.

6. Detection

AD-605 221 Div. 6, 8
OTS Prices: HC $3.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
TARGET RESOLUTION: CAPABILITIES OF MODERN RADAR AND FUNDAMENTAL LIMITS,
by A. W. Rihaczek. 27 Jul 64, 54p TDR-269(4250-43)-2
Contract AF04 695 269
SSD TDR64 107

Unclassified report

Descriptors: (*Target discrimination, Radar), (*Radar, Target discrimination), Resolution, Effectiveness, Theory, Radar signals, Ranges (Distance), Doppler effect.

The growth in radar requirements, from crude short-range measurements to dense-target resolution at long ranges, is paralleled by a corresponding increase in the sophistication of radar systems: from simple constant-carrier pulses to post-detection integration, coherent integration of pulse trains, pulse compression signals, and the coherent processing of trains of such signals. The study starts with an interpretation of the radar uncertainty relation in its significance for target resolution, showing the role of waveform design as a means of achieving a match between the transmitted signal and the characteristics of the target environment. This provides a framework into which the various principles of high-resolution radar are fitted. In discussing the limitations on resolution performance, it is shown that achievable target resolution depends on the characteristics of the target environment in which the radar operates, the number of targets, and the size of the delay-Doppler space they occupy. These findings are applied to two practical examples: (1) the ground mapping radar using the synthetic aperture principle and (2) the case of extended target 'clouds' consisting of a large number of discrete scatterers. (Author)

AD-605 322 Div. 6, 16
OTS Prices: HC $3.00/MF $0.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ECHOLOCATION WITH WIDE-BAND WAVEFORMS: BAT SONAR SIGNALS,
by D. A. Cahlander. 6 May 64, 82p LL-TR-271
Contract AF19 628 500
ESD TDR64 60

Unclassified report

Rept. is based on a thesis of the same title submitted in partial fulfillment of the requirements for Ph. D.

Descriptors: (*Bats, Sonar signals), (*Sonar signals, Bats), (Echo ranging, Bats), Sound signals, Broadband, Sonar, Statistical analysis, Mathematical models, Functions, Acoustic equipment, Frequency modulation, Antennas, Electronic recording systems, Computers, Errors, Graphics, Theory, Target acquisition.

The wide-band, echolocating sonar signals of bats are investigated with reference to statistical estimation theory to ascertain the implications of this class of signals. The work is divided into four major sections: (1) The concept of an ideal receiver for the simultaneous measurement of range and velocity of a target is extended to cover wide-band signals; (2) angular localization of a target by means of a fixed, gain-dispersive antenna in the presence of additive Gaussian noise is studied; (3) an ambiguity diagram computer is designed and built which calculates the signal function, defined in Chapter 2, of an arbitrary waveform; and (4) ambiguity diagrams are calculated for several types of bat sonar signals emitted by the bat Myotis lucifugus and one cruising signal emitted by the bat Lasiurus borealis. (Author)

AD-605 367 Div. 6, 8
OTS Prices: HC $6.00/MF $1.25

Ordnance Research Lab., Pennsylvania State Univ., University Park.
DIGITAL CORRELATION DETECTION OF DOPPLER SHIFTED SIGNALS,
by C. S. Miller. 17 Aug 64, 248p
Contract NOw63 0209c

Unclassified report

Descriptors: (*Doppler effect, Signals), (*Signals, Detection), (*Detection, Correlators), (*Correlators, Digital systems), Matched filters, Simulation, Correlation techniques, Statistical processes, Probability, Radar signals, Radar reflections, Radar interference, Sonar signals, Electromagnetic wave reflections, Linear systems, Mathematical analysis, Signal-to-noise ratio.

The optimum linear filter for detecting a signal in a white noise background using the peak signal to the rms noise ratio maximization as a criterion is the matched filter. In practical systems matched filter performance can be obtained, approximately, with a digital correlator. For the digital correlator, the problem of providing matched filter detection over a range of Doppler corresponds to providing a number of sets of Doppler reference samples in compressed time. To provide a background for the discussion of the synthesis of sets of Doppler reference samples, the derivation of the matched filter equations is given as well as a discussion of the ambiguity function and the Doppler effect. A theorem is proved which states that the effect of Doppler on a signal sampled at a uniform rate is equivalent to a change in the sampling rate. A survey of digital correlator techniques is presented, and the operation of the Compressed Time Parallel Correlator, which is believed to be a new technique, is explained.

AD-605 519 Div. 6
OTS Prices: HC $3.00/MF $0.75

General Dynamics/Fort Worth, Tex.
AN ANALYSIS OF THE SCATTERING MATRIX MEASUREMENT CAPABILITIES OF A GROUND PLANE RADAR CROSS SECTION RANGE,
Rept. no. 4,
by C. C. Freeny. Jun 64, 99p FZE-222-4
Contract AF30 602 2831, Proj. 6503
RADC TDR64 317

Unclassified report

Descriptors: (*Radar echo areas, Polarization), (*Radar signals, Scattering), Radar targets, Radar reflections, Phase measurement, Vector analysis, Matrix algebra, Errors.

The concept of the polarization scattering matrix is presented in this report. Measurement techniques leading to the determination of the scattering matrix on a radar range are discussed. The polarization dependence of measurements on a ground plane range are noted. Matrix-determination techniques are examined in the context of ground-plane-range operation. The utility of performing scattering matrix measurements on the RAT SCAT range is discussed. Finally a specific measurement technique is chosen for the scattering matrix solution; consideration of operational ease and measurement accuracy forms the basis of this choice. (Author)

AD-605 520 Div. 6
OTS Prices: HC $3.00/MF $0.75

General Dynamics/Fort Worth, Tex.
EXPERIMENTAL RESULTS OF CIRCULAR POLARIZATION AND SCATTERING MATRIX MEASUREMENTS,

repetitive steps and improvement of a number of operations was accomplished. Improved methods for etching, contact deposition, surface treatment, and package fabrication have been effected. Background radiation effects and material parameters were studied. Twelve preproduction detectors will be fabricated to determine the reliability of the detector that has been developed. (Author)

AD-606 095 Div. 6
OTS Prices: HC $3.00/MF $0.50

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
ELECTROMAGNETIC SCATTERING BY GYROTROPIC CYLINDERS WITH AXIAL MAGNETIC FIELDS.
Scientific rept. no. 28,
by W. C. Y. Lee, L. Peters, Jr., and C. H. Walter.
15 May 64, 51p OSURF-1116-48
Contract AF19 604 7270, Proj. 5633, Task 563306
AFCRL 64 717

Unclassified report

Descriptors: (*Radar echo areas, Optics), (*Radar reflections, Cylindrical bodies), (*Radar targets, Electromagnetic waves), Scattering, Magnetic fields, Optics, Geometry, Radar transmitters, Measurement, Radar.

The modified geometrical optics method is applied to find the radar cross section of an infinite, gyrotropic, circular cylinder with an axial magnetic field. The results compare favorably with those obtained using the boundary value solution. The modified geometrical optics method offers the advantage that it may be applied to a general cylindrical cross section without further development. It may also be applied to other orientations of magnetic field but the computations are much more tedious. (Author)

AD-606 106 Div. 6, 8
OTS Prices: HC $6.00/MF $1.25

Air Force Cambridge Research Labs., Bedford, Mass.
THE MODIFICATION OF ELECTROMAGNETIC SCATTERING CROSS SECTIONS IN THE RESONANT REGION. A SYMPOSIUM RECORD, VOLUME I.
Special reports,
ed. by J. K. Schindler and R. B. Mack. Sep 64, 205p
Proj. 5635
AFCRL 64 727 V1; AFCRL SR6

Unclassified report

Symposium held at L. G. Hanscom Field, Bedford, Mass., 4 Jun 63.

Descriptors: (*Electromagnetic waves, Scattering), (*Scattering, Symposia), Radar targets, Cavity resonators, Resonance, Electrical impedance, Reduction, Cylindrical bodies, Plasma medium, Spheres, Antenna components, Radar echo areas.

Contents: Some thoughts on scattering cross sections in the resonance region; The minimization of the backscattering of a cylinder by a central loading; Backscatter reduction of long thin bodies by impedance loading; Theoretical and experimental investigation of backscattering from a cavity-loaded monopole; Scattering from thick reactively loaded rods; Analysis of loaded terminal scatters; Some bounds to the behavior of small resonant scatterers; A determination of the scattering from a cavity-backed plane surface; Some concepts for reducing reflectivity from antenna apertures; Radar cross section of perfectly conducting dielectric, and dielectrically clad infinite cylinders at arbitrary incidence; Effect of surface diffusivity upon the scattering characteristics of a plasma sphere; Absorption resonance effects in plasma spheres.

RESEARCH DIRECTED TOWARD THE INVESTIGATION OF SUITABILITY OF THE GLOTRAC TYPE G TRANSPONDER FOR USE IN THE RANGE CALIBRATION SATELLITE.
Final rept., part C, vol. 2,
by R. Braun. 1 Jul 64, 74p GD/A-63-1195(C)vol. 2
Contract AF19 628 3274, Proj. 5930, Task 593004
AFCRL 64 240C
Unclassified report

See also AD-438 936.

Descriptors: (*Transponders, Satellites (Artificial), (*Satellites (Artifical), Range finding), Radiofrequency interference, Simulation, Environmental tests, Space environmental conditions, Telemeter systems, Radiofrequency filters, Power supplies, Gain, Circuits, Temperature, Reliability (Electronics), Tracking, Design.

The report covers three areas of investigation of the GLOTRAC transponders. The transponder testing in accordance with the electromagnetic interference requirements and the test results are discussed. The development of a breadboard line filter is described which allows the GLOTRAC transponder to meet the electromagnetic interference requirements. An investigation of the temperature stability problems of the GLOTRAC received signal strength telemetry circuit is discussed. (Author)

AD-605 837 Div. 6, 1
OTS Prices: HC $5.00/MF $1.00

Young (David W.) and Associates, Inc., Canoga Park, Calif.
HIGH SPEED, RASTER SCANNING, HIGH RESOLUTION, RADAR SENSOR FOR VERTICAL DISPLAY.
Final rept. for 30 Jul 63-30 Jul 64.
30 Jul 64, 168p
Contract Nonr4032 00
Unclassified report

Rept. on Janair, Joint Army-Navy Aircraft Instrumentation Research, see also AD-435 558.

Descriptors: (*Radar scanning, Airborne), (*Crossed field devices, Radar scanning), Radar antennas, K band, Display systems, Multiple beam antennas, Phase shifters, Antenna lobes, Monopulse radar, Ferroelectric materials, Electronic scanners, Transmission lines, Antenna feeds, Drives, Flight instruments, Aircraft landings, Terrain avoidance.

The report itemizes the advantages and unique characteristics of the Crossed Beam two-dimensional Radar Scanning (CBRS) techniques along with the supposed disadvantage of low aperture efficiency. More than 50 illustrations are used to carefully exhibit design techniques, specific test methods and results, including 16 mm and 8 mm action film clips, which exhibit system and antenna performance. Major emphasis is given the 49 element, series-parallel ferrite, Ku-Band, electronic scanning (30 degrees continuous scan in 1200 us) antenna. Performance of both the 25 frame/second Electromechanical (vibrating ridge) and the Electronic Antenna is demonstrated through comparison of optical and microwave images, when using either antenna to transmit or receive. The antennas are demonstrated using a radar system. Range capability of less than 10 feet and more than 2 miles is demonstrated.

AD-605 859 Div. 6, 26
OTS Prices: HC $3.00/MF $0.5

Lansdale Div., Philco Corp., Pa.
PEM FOR GOLD-DOPED GERMANIUM INFRARED DETECTOR TYPE IR400.
Quarterly progress rept. no. 6, 27 Mar-30 Jun 64,
by A. Guimento. 30 Jun 64, 56p
Contract DA36 039AMC01464E, Proj. H200
Unclassified report

See also AD-602 213.

Descriptors: (*Germanium, Infrared detectors), (*Infrared detectors, Production), Manufacturing methods, Specifications, Gold, Barium compounds, Fluorides, Infrared windows, Heat exchangers, Tests, Life expectancy, Impurities, Quality control, Mechanical drawings, Data.

Work during this period was concentrated on the preproduction phase of the contract. The preproduction samples were fabricated and partially tested, and preliminary data is included. Mechanical alignment problems have been rectified by means of a new alignment and sealing tool. The Inspection and Quality Control Plan, and the Equipment Requirements and Production Rate Plan have been submitted.

AD-605 876 Div. 6, 12, 22
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON POSSIBILITY OF DETECTION OF BALLISTIC AND GUIDED ROCKETS,
by Yu. A. Ivanov and B. V. Tyapkin. 22 Apr 64, 16p
FTD MT64 121, TT 64 71400
Unclassified report

Edited machine trans. of mono. Infrakrasnaya Tekhnika v Voennom Dele (Infrared Technology in Military Science) Moscow, 1963, p. 285-292, 357-359.

Descriptors: (*Guided missile detection, Infrared detectors), (*Infrared detectors, Guided missiles), Guided missile defense systems, Detection, Rockets, Infrared research, Ordnance, USSR.

General discussion of the possibility of detecting ICBM's using infrared equipment.

AD-606 063 Div. 6, 26
OTS Prices: HC $1.00/MF $0.50

Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURE TO INVESTIGATE PROPERTIES OF INDIUM ANTIMONIDE AND TO PROVIDE 801-C6 INFRARED DETECTORS.
Quarterly progress rept. no. 5, 27 Dec 63-27 Mar 64,
by Robert L. Smythe and William L. Kolander.
27 Mar 64, 17p TII-03-64-61
Contract DA36 039AMC01463E, Proj. S4089
Unclassified report

Also see AD-435 613

Descriptors: (*Infrared detectors, Production), Manufacturing methods, Indium alloys, Antimony alloys, Performance (Engineering), Test facilities, Photoconductivity, Epoxy plastics, Vacuum seals, Etched crystals, Gold, Vapor plating, Cleaning, Resistance (Electrical), Crystal growth, Crystals.

Special reports and manuals have been submitted and approved for implementation in the manufacturing process. The processes were studied and modified in an effort to increase production rates and yields. Elimination of

AD-605 536 Div. 7, 26
OTS Prices: HC $2.00/MF $0.50

Astron Corp., East Newark, N. M.
PRODUCTION ENGINEERING MEASURE FOR CAPACITOR VAPORIZED TEFLON, METALLIZED GLOW-DISCHARGED DEPOSITED DIELECTRIC FILM.
Quarterly rept. no. 6, 1 Apr-30 Jun 64,
by Andrew M. McConnell. 30 Jun 64, 50p
Contract DA36 039AMC01459E

Unclassified report

See also AD-437 185

Descriptors: (*Capacitors, Manufacturing methods), Fixed capacitors, Dielectric films, Polyethylene plastics, Halocarbon plastics, Vapor plating, Metal films, Aluminum, Glow discharges, Electric insulation, Electrodes, Soldering, Cooling, Production.

Additional capacitors of all three ratings were wound and tests were performed at each stage of manufacturing to determine, if possible, the particular manufacturing operation which was causing most of the difficulty. The major problems encountered were high power factor again and low insulation resistance in the 1.0 mfd. and 4.0 mfd. capacitors. One of the manufacturing procedures which apparently was causing some difficulty was the soldering of the pigtails by normal production techniques. Since it was found that the use of normal temperatures required for making the solder connection of the pigtail to the section coupled with the pressures caused by the application of the soldering iron would cause an apparent rupture of the aluminum electrode at the point of contact. It was also found that cooling of the sections to room temperature was necessary to avoid overheating during the spraying operation. (Author)

AD-605 539 Div. 7, 8, 20
OTS Prices: HC $2.00/MF $0.50

General Electric Co., Pleasanton, Calif.
INVESTIGATION OF THERMIONIC CONVERTER OPERATING WITH A HIGH TEMPERATURE COLLECTOR.
Quarterly technical rept. no. 2, 15 May-15 Aug 64,
by E. Blue and J. H. Ingold. 15 Aug 64, 48p GEST-2037
Contracts AF33 615 1545; AF29 601 6314, Proj. 8173
Task 817305

Unclassified report

See also AD-601 007.

Descriptors: (*Thermionic converters, Performance (Engineering)), Electrodes, Thermal properties, Vacuum, Cesium, Vapors, Calibration, Tungsten, Tantalum, Emissivity, Work Functions, Electrical properties, Liquid metal coolants, Sodium, Potassium, Light, Absorption, Nuclear reactors, High-temperature research.

The work carried out with the uncooled collector converter was the following: (1) measurement of electrode work functions in vacuo; (2) thermal calibration of the emitter in vacuo; (3) thermal calibration of the emitter in cesium vapor; (4) measurement of current-voltage characteristics and converter efficiencies for a variety of electrode temperatures, electrode spacings, and cesium vapor measures; (5) assemble the cooled collector converter with the new NaK cooled collector. In addition, it was found necessary to do two other calibrations concerned with accurate measurement of the electrode temperatures. One of these calibrations had to do with a reflection effect which resulted in the observed electrode temperatures being higher than their actual values. The second calibration had to do with light absorption in cesium vapor at high pressure.

AD-605 684 Div. 7, 4
OTS Prices: HC $2.00/MF $0.50

Calvin Coll., Grand Rapids, Mich.
SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ZINC BATTERIES.
Quarterly technical progress rept. no. 3,
1 Jun-1 Sep 64,
by T. P. Dirkse. 1 Sep 64, 34p
Contract AF33 615 1236, Proj. 8173, Task 817304 16

Unclassified report

Descriptors: (*Batteries and components, Alkaline cells), (*Alkaline cells, Electrochemistry), (Surface-active substances, Alkaline cells), Diffusion, Hydroxides, Zinc compounds, Transport properties, Zinc, Electrodes, Electroplating, Life expectancy, Electrolytes, Silver compounds, Oxides, Potassium compounds, Solutions, Decomposition, Battery separators, Cellulosic plastics, Performance (Engineering); Ions.

The applicability of Fick's law of diffusion to the diffusion of hydroxide and zincate ions through a cellophane membrane has been studied and verified. The effect of surfactants on the type of zinc deposit obtained when zinc is electroplated from a zincate solution has been studied over a range of current densities and zincate concentrations. These surfactants have also been incorporated in the zinc electrode. A few of these surfactants appear to improve the cycle life characteristics of the zinc electrode. However, when incorporated in the electrolyte they seem to afford no improvement in cycle life at higher current densities. The decomposition of Ag20 in KOH solutions has been followed and the effect of added materials on this process has been noted. (Author)

AD-605 754 Div. 7
OTS Prices: HC $2.00/MF $0.50

Gulton Industries, Inc., Metuchen, N. J.
LITHIUM-NICKEL HALIDE SECONDARY BATTERY INVESTIGATION.
Quarterly technical progress rept. no. 3,
by A. E. Lyall and H. N. Seiger. 16 Sep 64, 30p
Contract AF33 615 1266, Proj. 8173, Task 817304

Unclassified report

Descriptors: (*Batteries and components, Alkaline cells), (*Electrodes, Batteries and components), (*Electrolytes, Batteries and components), Anodes (Electrolytic cell), Cathodes (Electrolytic cell), Polarization, Nickel compounds, Fluorides, Chlorides, Lithium, Impurities, Aluminum, Chlorine, Conductivity, Aluminum compounds, Aliphatic compounds, Carbonates, Aromatic compounds, Phosphorous compounds.

Polarization tests have been obtained for the nickel fluoride cathode. These data indicate a high degree of polarization on both charge and discharge. Improvements in both the polarization and utilization of the nickel chloride cathode have been achieved. Electrochemical formation greatly improves utilization. The lithium anode has been found to be satisfactory and is not a limiting factor at present. Examination of a laboratory cell after cycling is discussed. A precipitate formed in the electrolyte on cycling has been found to be 2% aluminum and 35% chlorine. This combination does not bear out the hypothesis of a hydrolized aluminum chloride since the ratio of chlorine to aluminum is too great. A project review was conducted by the research staff. Based on the data available from compatability tests and electrochemical tests, a hypothetical cell has been designed. (Author)

7. Electrical Equipment

AD-605 229 Div. 7, 22, 30
OTS Prices: HC $1.00/MF $0.50

Stanford Research Inst., Menlo Park, Calif.
PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES: ADDITIONAL GAGE DEVELOPMENT.
Progress rept. nos. 36 and 5, 1-31 Aug 64, 2 Sep 64, 22p
Contracts DA49 146XZ096, DA49 146XZ280, Projs. GPU3713, GPU4832

Unclassified report

See also AD-602 513.

Descriptors: (*Shock waves, Measurement), (*Piezoelectric transducers, Design), (*Pressure gages, Transducers), Heating, Copper alloys, Manganese alloys, Nickel alloys, Wire, Electric insulation, Epoxy plastics, Thermodynamics.

In order to determine the effects of heating on the pressure measurements, it is necessary to determine a temperature-vs-time relation for the Manganin gage wire. This is expected to be made up of two parts--direct shock heating of the wire and, predominantly, conduction of heat from the shocked C-7 insulator to the wire. The report deals with calculations of shock temperatures reached in the C-7 insulator due to Hugoniot pressures greater than 500 kbar.

AD-605 310 Div. 7, 12
OTS Prices: HC $2.00/MF $0.50

Air Force Aero Propulsion Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
THERMAL VACUUM TEST OF ORBITAL STATIC MOISTURE-REMOVAL FUEL CELL.
Rept. for 16 Mar-20 Mar 64, by L. S. Harootyan, Jr. Jul 64, 30p
Proj. 8173, Task 817303
APL TDR64 72

Unclassified report

Descriptors: (*Fuel cells, Environmental tests), Dehydration, Moisture, Heat, Space environmental conditions, Spaceborne, Spacecraft, Hydrogen, Oxygen, Vacuum apparatus.

The report presents the results of a thermal vacuum chamber test of an orbital fuel cell of advanced design. The fuel cell package used a static moisture-removal system. The fuel cell, tested in the thermal vacuum chamber at Wright-Patterson AFB, gave satisfactory results. This test constituted the second and final ground qualification of this orbital fuel cell prior to orbital test. (Author)

AD-605 363 Div. 7, 4
OTS Prices: HC $4.00/MF $1.00

Tyco Labs., Inc., Waltham, Mass.
RESEARCH RELATING TO FUEL CELLS. PALLADIUM AND PALLADIUM-SILVER HYDROGEN DIFFUSION ELECTRODES.
Final and summary rept. for 1 Oct 62-30 Jun 64, by A. C. Makrides. 31 Jul 64, 146p
Contract DA49 186ORD982

Unclassified report

Descriptors: (*Fuel cells, Electrodes), (*Electrodes, Thermodynamics), Diffusion, Hydrogen, Palladium alloys, Silver alloys, Electrochemistry, Electrolytes.

The concept of a solid-state diffusion electrode is described with particular reference to hydrogen diffusion electrodes utilizing Pd and Pd-Ag alloys. The thermodynamics of the H-Pd system are reviewed and the aspects relevant to diffusion electrodes are discussed in detail. An experimental study of the thermodynamics of Ag-Pd electrodes is presented.

AD-605 425 Div. 7
OTS Prices: HC $2.00/MF $0.50

Harshaw Chemical Co., Cleveland, Ohio.
INVESTIGATION OF THIN FILM CADMIUM SULFIDE SOLAR CELLS.
Quarterly technical progress rept. no. 3, 26 May-25 Aug 64, by J. C. Schaefer, R. J. Humrick, and R. F. Belt. 9 Aug 64, 42p
Contract AF33 615 1248, Proj. 8173, Tasks 817301, 817332

Unclassified report

See also AD-601 459.

Descriptors: (*Solar cells, Films), (*Cadmium compounds, Sulfides), Energy conversion, Batteries and components, Electroplating, Vapor plating, Degradation, Chemical milling, Copper compounds, Chlorides, Silicon compounds, Monoxides, Surface properties, Effectiveness.

The degradation of electroplated cells has been closely observed and it has been found that recovery can be accomplished under proper conditions. Chemical milling of the substrate is an excellent method for producing high power to weight ratio cells. Fabrication of the one-half and one square foot mechanical sample arrays indicate improved total area utilization factors. Photovoltaic cells and diodes have been prepared by first depositing a thin film of CuCl on CdS. The CuCl was subsequently converted to Cu9,5S5 by means of H2S. Optical studies on electroplated and chemiplated barriers have served to confirm the presence of Cu2S alone or mixed with CuS. Thin layers of SiO have been utilized as a water vapor barrier to significantly decrease degradation of cells. Additional theoretical work has been performed on a heterojunction model of the cell operation. (Author)

AD-605 463 Div. 7
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A MAGNETO-DYNAMIC TRIGGER,
by B. V. Bolotov and V. F. Kalyuzhnyi. 6 Aug 64, 5p
FTD TT64 637; TT 64 71312

Unclassified report

Unedited rough draft trans. of Russian patent 156621 (appl. 779652/26-24, 23 May 62).

Descriptors: (*Magnetic cores, Trigger circuits), (*Trigger circuits, Magnetic cores), Switching circuits, Magnetic coils, Design, Hysteresis, Patents, USSR.

A new trigger is proposed containing a magnetic core with three magnetic contours of a material having hysteresis loops in a nearly rectangular position, and characterized by the fact that for the purpose of expanding the limits of the signal switch connection with power output, a 'Kholla' pick-up is placed in the first magnetic conteur and, in the magnetic circuit of the other two, are placed toroidal cores on which is wound a commutating winding. (Author)

Technical progress rept. no. 23, 1-31 Dec 59,
by Ernest A. Lamont. 31 Dec 59, 16p
Contract AF04 647 158

Unclassified report

Descriptors: (*Pressure switches, Performance (Engineering)), (*Guided missile components, Pressure switches), Environmental tests, Pressure, Electric switches, Magnesium alloys, Plating, Low temperature research, Pressure regulator, Helium, Hydrogen, Guided missiles, Vibration.

AD-606 114 Div. 7, 12
OTS Prices: HC $1.00/MF $0.50

Frebank Co., Glendale, Calif.
PRESSURE SWITCH.
Technical progress rept. no. 24, 1-31 Jan 60,
by Ernest A. Lamont. 31 Jan 60, 4p
Contract AF04 647 158

Unclassified report

Descriptors: (*Pressure switches, Performance (Engineering)), (*Guided missile components, Pressure switches), Pressure, Environment tests, Vibration, Electric switches, Failure (Mechanics), Guided missiles.

AD-606 116 Div. 7, 12
OTS Prices: HC $1.00/MF $0.50

Frebank Co., Glendale, Calif.
PRESSURE SWITCH.
Technical progress rept. 26, 1 Mar-31 Mar 60,
by M. D. Ferguson. 31 Mar 60, 5p
Contract AF04 647 158

Unclassified report

Descriptors: (*Pressure switches, Performance (Engineering)), (*Guided missile components, Pressure switches), Environmental tests, Temperature, Pressure, Electric switches, Failure (Mechanics, Guided missiles, Springs.

AD-605 931 Div. 7, 12, 25
OTS Prices: HC $3.00/MF $0.75

General Instrument Corp., Newark, N. J.
SOLAR FLAT PLATE THERMOELECTRIC GENERATOR RESEARCH,
by Robert E. Rush. 14 Sep 64, 98p
Contract AF33 657 10335, Proj. 8173, Task 817302
APL TDR64 87

Unclassified report

Descriptors: (*Solar panels, Thermoelectricity), (*Thermoelectricity, Solar panels), Generators, Energy conversion, Solar radiation, Optical coatings, Electrical power production, Structural parts, Aluminum, Environmental tests, Bismuth alloys, Tellurium alloys, Spacecraft, Power supplies, Expanded plastics, Honeycomb cores, Metal plates, Joining, Performance (Engineering), Corrosion, Lithium, Liquid metals, Sublimation, Design, Storage, Semiconductors, Thermocouples.

A solar flat plate thermoelectric converter consists of a collector plate with an optically selective coating, small size thermoelements, a radiator plate and a support. The collector and radiator plates were folded into self-supporting structures which, combined with aluminum tubular members, comprised the panel support configuration. This design resulted in a very low converter weight, only 53 grams per square foot. A number of prototype panels, were fabricated and tested. The panels passed specified environmental test without physical or electrical changes. Evaluation of the optically selective coating disclosed that the coating efficiency actually obtained in the pilot production runs was only 80% of the literature value. The processing of the bismuth telluride thermoelectric material into the shape and size required for the solar panels caused a decrease in performance relative to large size thermoelements. This decrease, combined with basic material properties inferior to literature values, resulted in a thermoelectric efficiency only 50% of that initially expected. The overall panel performance in the Earth orbit operational temperature regime resulted in approximately 11 watts per pound of panel.

AD-605 957 Div. 7, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
DESIGN CRITERIA FOR SILICON SOLAR CELL POWER SUPPLIES,
by P. C. Robison, 27 Feb 59, 24p
STL/TN-59-0000-00234

Unclassified report

Descriptors: (*Solar cells, Silicon), (*Spacecraft, Power supplies), (*Power supplies, Solar cells), Design, Coatings, Geometric configurations, Electrical properties, Temperature, Temperature control, Solar radiation, Glass, Solar panels, Emissivity, Electric currents, Energy conversion, Mathematical analysis, Performance (Engineering), Space probes.

General principles of design are outlined for the use of silicon solar cells for power in space probes. Several electrical characteristics important to design are considered. Analysis of possible geometric configurations of solar cells is given along with a semi-empirical method. Mention is made of temperatures and temperature control. The results are used to indicate a design approach.

AD-605 992 Div. 7, 19, 31
OTS Prices: HC $1.00/MF $0.50

Westinghouse Electric Corp., Lima, Ohio.
100 WATT THERMOELECTRIC POWER SYSTEM FOR BUOY APPLICATIONS.
Monthly progress rept. no. 3, 11 Aug-11 Sep 64,
by Dale A. Naumer. 11 Sep 64, 14p
Contract N600 61533 61992

Unclassified report

Descriptors: (*Thermoelectricity, Buoys), (*Buoys, Power supplies), Heat transfer, Ventilation ducts, Control systems, Circuits, Temperature control, Combustion, Ignition, Safety devices, Thermal insulation, Performance (Engineering), Electric power production, Thermocouples, Marker lights, Bismuth, Tellurium, Modules (Electronic), Generators, Life expectancy.

The investigation of the heat transfer in the intake and exhaust stack was completed and a design finalized. A breadboard model of the control unit was constructed and tested. A hot wire ignitor and a flame detector were built and tested in conjunction with the control breadboard. A prototype oceanographic buoy was inspected prior to its being launched at Jacksonville, Florida. The test data obtained on the two BiTe modules was analyzed. (Author)

AD-606 084 Div. 7, 26
OTS Prices: HC $2.00/MF $0.50

Research Labs. for the Engineering Sciences, Univ. of Virginia, Charlottesville.
RESEARCH INVESTIGATION OF MAGNETIC AND ELECTRIC FORCES FOR ROTATING SHAFT SUSPENSION.
Quarterly technical progress rept. for Jun-Aug 63,
by M. G. Foster. Sep 63, 42p EMI-3421-102-63U
Contract AF33 657 8352

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy. Also see AD-406 286.

Descriptors: (*Shafts, Bearings), (*Suspension devices, Magnetic fields), (*Bearings, Magnetic fields), Servomechanisms, Servo amplifiers, Resonance, Vibration, Magnetic coils, Damping, Dynamics, Motor generators, Rotation, Armatures, Tests, Mathematical analysis.

Rotating motor-armatures, supported on magnetic fields without any contact between solid surfaces and spun at speeds of 3400 to 6000 rpm are reported. This type of bearing requires an active servo in at least one dimension, and this servo is often found to couple rather stubbornly to flexure vibrations of mechanical elements of the system. Ways of eliminating this vibration lock-on will be important future objectives of the investigation. (Author)

AD-606 109 Div. 7
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
NOTES ON THE RELIABILITY OF ELECTRICAL CONNECTORS,
by F. Troeger. 3 Oct 56, 6p GM45.2-117

Unclassified report

A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Electric connectors, Reliability (Electronics), Failure (Mechanics), Design, Performance (Engineering).

AD-606 113 Div. 7, 12
OTS Prices: HC $1.00/MF $0.50

Frebank Co., Glendale, Calif.
PRESSURE SWITCH.

OXIDE AND PARTS PRODUCED FROM IMPORTED ORES.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 64,
by J. F. Blum and J. N. Wambold. 31 Mar 64, 50p
Contract DA36 039AMC01481E

Unclassified report

Descriptors: (*Ceramic materials, Electronic equipment), (*Beryllium compounds, Oxides), (*Electronic equipment, Production), Powders, Ores (Metal sources), Sulfates, Hydrates, Crystals, Heat treatment, Sintering, Powder metallurgy, Extrusion, Bonding, Material forming, Molybdenum alloys, Manganese alloys, Metal coatings, Tensile properties, Mixtures.

Pilot plant studies show that a uniform beryllium oxide powder is produced by calcination of beryllium sulfate crystals, even though conditions are varied from run to run beyond normal production calcination operating limits. Dry blending, as an alternate process to the wet ball milling technique, was evaluated and found to produce parts with non-homogeneous and unsatisfactory sintered density. Pits were prevalent throughout the body. Grade I and Grade V BeO were found to react similarly during dry blending and subsequent cold pressing and sintering. Extrusion process improvement was initiated, and a die with various size inserts is now available. The strength of the bond developed between the basic molybdenum-manganese metallizing layer and a 99% BeO body was evaluated and improved by altering the composition of the metallizing mixture. The tensile strength of the improved metal-BeO bond approaches 10,000 p.s.i. (Author)

AD-605 183 Div. 8
OTS Prices: HC $1.00/MF $0.50

Rome Air Development Center, Griffiss AFB, N. Y.
EXPERIMENTAL INVESTIGATION OF VOLTAGE-CURRENT CHARACTERISTICS OF XENON FLASHTUBES,
by Fred J. Demma. Aug 64, 20p
Proj. 4506, Task 450608
RADC TDR64 294

Unclassified report

Descriptors: (*Discharge tubes, Xenon), (*Xenon, Discharge tubes), Lasers, Helixes, Performance (Engineering), Voltage, Electric currents, Impedance matching, Circuits, Pumping (Electronics), Electromagnetic pulses, Electron tubes.

This report presents the results of the experimental investigation of the voltage-current (V/I) characteristics of xenon-filled helical flashtubes. The purpose of these experiments was to determine the form of the flashtube's dynamic resistance and its value during conduction. The data obtained is the basis for the development of impedance matching circuitry (pulse forming networks) in the energy discharge circuit to permit maximum energy transfer between energy source and the flashtube. This consideration is particularly important for the attainment of an optimum design for high energy lasers. It should be noted that at the time of this investigation, February 1963, helical flashtubes were the only type readily available for high energy laser experiments and dynamic voltage-current data on these flashtubes was virtually nonexistent. Furthermore, accurate dynamic resistance data is still not generally available, and this lack served as the motivation for this report. This investigation, although confined experimentally to helical flashtubes, also yielded results which apply to linear tubes. (Author)

AD-605 188 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Hughes Research Labs., Malibu, Calif.
ENHANCED BOMBARDMENT INDUCED CONDUCTIVITY STORAGE TARGET FOR MEMORY TUBES.
Interim engineering rept. no. 2, 1 Apr-30 Jun 64,
by N. H. Lehrer. 30 Jun 64, 36p
Contract AF33 615 1128

Unclassified report

Descriptors: (*Storage tubes, Electron bombardment), (*Electron bombardment, Storage tubes), Excitation, Electrical conductance, Electron beams, Dielectric films, Metal films, Semiconducting films, X-ray diffraction analysis, Thin films (Storage devices), Aluminum compounds, Sulfates, Electrodes, Construction, Capacitance.

A preliminary analysis was made of the SEBIC data by comparison with models based on barriers formed by metal-to-semiconductor contacts and p-n junctions. The capacitance of the SEBIC layer in the back-biased condition varies in proportion to the inverse of approximately the one-third power of the applied voltage. The volt-ampere characteristic indicates that the reverse current tends to saturate when the applied voltage is of the order of a few volts. These data imply that a barrier region is formed which has a high donor density in the bulk SEBIC dielectric; the data are consistent with those of a barrier produced by graded p-n junctions rather than a metal-to-semiconductor contact. SEBIC layer fabrication techniques were studied. In particular, experiments were conducted to determine the optimum thermal processing time and temperature for fabricating SEBIC layers exhibiting the most sustained change in conductivity for the longest time. X-ray diffraction studies were conducted to determine the nature of the SEBIC layer barrier material.

AD-605 190 Div. 8,30
OTS Prices: HC $2.00/MF $0.50

Massachusetts Inst. of Tech., Cambridge.
A 1000 C. P. S. TRANSISTORIZED RESOLVER DRIVE AMPLIFIER.
Bachelor of science thesis,
by William Glover Seeley. May 58, 50p DSR-52-126
Contract AF04 645 9

Unclassified report

Descriptors: (*Transistor amplifiers, Analog computers), (*Amplifiers, Extremely low frequency), Feedback amplifiers, Phase shift, Gain, Electrical impedance, Transistors, Circuits, Tuned circuits, Wiring diagrams, Feasibility studies, Design.

The purpose of this work is to determine the feasibility of design of a 1000 c. p. s. transistorized resolver drive amplifier, to be used as part of an analog computing system. In the design the voltage gain expression of the amplifier, derived on a current basis, along with the forward gain of the amplifier, is utilized to determine the necessary values of input impedance, output impedance, and current gain for any desired accuracy of summation. Finally a resolver drive amplifier was designed and built. A specified accuracy of 1 part in 1000 was obtained with an accompanying phase shift of less than 9 minutes of arc between input and output. Recommendations for improvement of the system are discussed. (Author)

AD-605 192 Div. 8, 6
OTS Prices: HC $0.50/MF $0.50

Naval Research Lab., Washington, D. C.
A SOLID STATE LOGARITHMIC VIDEO AMPLIFIER FOR PULSE APPLICATIONS,
by R. L. Slice. 11 Aug 64, 10p
NRL 6147

Unclassified report

8. Electronics and Electronic Equipment

AD-605 136 Div. 8, 22
OTS Prices: HC $6.00/MF $1.50

Scintilla Div., Bendix Corp., Sidney, N. Y.
RADIO INTERFERENCE GUARD (RIG) LOW PASS RADIO FREQUENCY ATTENUATOR.
Final technical rept. for 1 Jun 62-16 Jul 64,
by Karl Kraus. 16 Jul 64, 274p
Contract N178 8056

Unclassified report

Rept. on Development of RF Attenuators.

Descriptors: (*Attenuators, Radiofrequency), (*Explosives initiators, Electromagnetic shielding), (*Electromagnetic shielding, Explosives initiators), Low-pass filters, Attenuation, Miniature electronic equipment, Electromagnetic waves, Propagation, Manufacturing methods, Production, Performance (Engineering), Environmental tests, Electromagnetic fields, Radiofrequency interference.

The Radio Interference Guard (RIG) is a low pass filter which provides effective RF protection for electroexplosive devices. RF attenuation is obtained by propagation of electromagnetic radiation through a metallic barrier. The initial concept of the RIG was analyzed and DC and RF design parameters were established. Methods for complete electrical and environmental testing were devised. After successful qualification to NWL specifications, 100 units were made in production with production tooling. All units surpassed the specification of a maximum attenuation of 9 db at DC and a minimum attenuation of 35 db at 100 KC. Average values obtained were 8.1 db attenuation at DC and 39.2 db at 100 KC. As a result of this study, a RIG device that provides effective RF protection for electroexplosive devices was successfully designed, tested, qualified, and manufactured. (Author)

AD-605 140 Div. 8, 6, 12
OTS Prices: HC $2.00/MF $0.50

Smyth Research Associates, San Diego, Calif.
ATMOSPHERIC REFRACTION EFFECTS ON PRECISION RADAR TRACKING.
Feb 61, 44p SRA-179
Contract AF30 602 2084
RADC TR61 64

Unclassified report

Descriptors: (*Radar tracking, Atmospheric refraction), (*Atmospheric refraction, Radar tracking), Ranges (Distance), Azimuth, Doppler effect, Errors, Troposphere, Ionosphere, Angle of arrival, Radio interferometers, Satellites (Artifical), Guided missile tracking systems, Refractive index, Radar interference, Frequency shift, Experimental data, Geometry.

This report describes atmospheric effects on the three important radar tracking parameters; elevation angle error, range error and doppler error. The results of experimental sea-interferometer measurements using radio satellites are compared with those predicted on the basis of routine refractive index data. It is shown that observed elevation angle error usually exceeds predicted values by about 1.5 milliradians at 1 deg elevation angle and about 0.3mr at 8.5 deg elevation angle. Range error fluctuations are as much as 30 meters at 108mc. Doppler errors are of the order of a few cps at 108mc, at low elevation angles. Appendices are included, which describe in detail the computational methods for elevation angles of sea-interferometer minima, doppler frequency shift, and prediction of refractive effects using routine refractive index data. (Author)

AD-605 180 Div. 8, 5, 12
OTS Prices: HC $2.00/MF $0.50

Electromagnetic Research Corp., Washington, D. C.
AN AUTOMATIC IMPEDANCE MATCHER.
Interim rept. no. 1,
by Edward A. Wolff. 26 Oct 60, 26p ERC-61044-1
Contract AF04 647 269

Unclassified report

Descriptors: (*Impedance matching, Telemetering antennas), (*Telemetering antennas, Impedance matching), Automatic, Very high frequency, Slot antenna, Atmosphere entry, Guided missile antennas, Plasma sheath, Standing wave ratios, Antenna feeds, Attenuation, Circuits, Fenoelectric materials, Crystal detectors, Design, Re-entry vehicles.

An automatic impedance matcher has been designed to electronically tune a re-entry slot antenna to compensate for the detuning caused by the formation of the plasma sheath around the vehicle. The impedance matcher utilizes a phase-sensitive detection circuit which determines the magnitude and phase of the standing wave on the transmission line feeding the antenna. The output of this detector controls the voltage across a ferroelectric element whose capacitance is a function of this applied voltage. Two ferroelectric elements are used in the matcher, one in the antenna slot and one across the transmission line feeding the antenna. With this combination a VSWR of 30 or more can be adjusted electronically within milliseconds to a VSWR of 2 or less. (Author)

AD-605 181 Div. 8
OTS Prices: HC $2.00/MF $0.50

Raytheon Co., Burlington, Mass.
STUDY AND CORRECTION OF SPURIOUS POWER OUTPUT (RK6344 MAGNETRON).
Quarterly engineering rept. no. 4, 22 Apr-22 Jul 64,
by P. S. Bottorff. 22 Jul 64, 28p PT-778
Contract NObsr89518

Unclassified report

Report on project QR1248, see also AD-601 448.

Descriptors: (*Magnetrons, Power), (*Microwave equipment, Electron tubes), C band, Noise (Radio), Radiofrequency filters, Waveguide filters, Broadband, Resonance, Attenuation.

Work was devoted largely to the study of tubes using wideband output filters and tubes with non-standard vane shapes, as well as methods of combining into a single tube the various tube structures studied separately in the course of the program. The use of integral wide-band output filters is a very effective means of suppression of spurious signals, and some reduction in third harmonic signal level may be obtained by using slanted vanes in place of the standard square vanes. Combination of these features and others tested earlier in the program into a single tube should result in a magnetron with much reduced spurious output as compared to the standard RK6344A. (Author)

AD-605 182 Div. 8, 14, 17, 26
OTS Prices: HC $2.00/MF $0.50

Beryllium Corp., Reading, Pa.
PRODUCTION ENGINEERING MEASURE FOR BERYLLIUM

by Dante C. Youla. Aug 64, 216p PIBMRI-1213-64
Contract AF30 602 2868, Proj. 8505, Task DI64 02
RADC TDR64 332

Unclassified report

Descriptors: (*Electrical networks, Synthesis), Networks, Circuits, Matrix algebra, Functions, Polynomials, Electronic circuits.

This report presents a theory of cascade synthesis for lumped, passive n-ports based on a generalization of Richards' theorem to the matrix case. It is first shown that there is a natural way to define the 'zeros of transmission' of a rational positive-real matrix Z(p) and that the number of such zeros equals precisely (Z), the McMillan degree of Z(p). By applying the generalized Richards theorem at a zero of transmission, it is possible to induce a degree reduction in the terminating impedance matrix. If the degree reduction is restricted, from the outset, to equal, at most, one, two, or four units, the process generates the 2n-port analogues of the Richards, type E and Darlington 4-terminal A, B, C and D sections. The synthesis procedure encompasses nonreciprocal as well as reciprocal networks and economic realizations are achieved for all the primitive reciprocal sections and most of the nonreciprocal ones. (Author)

AD-605 265 Div. 8, 25
OTS Prices: HC $5.00/MF $1.00

Microwave Lab., Stanford Univ., Calif.
MODE COUPLING IN BOUNDED, COLD BEAM-PLASMA SYSTEMS.
Final rept.,
by J. C. Eidson. Aug 64, 152p ML-1146
Contract AF30 602 3098, Proj. 5579, Task 557904
RADC TDR64 189

Unclassified report

Partly supported by Hughes Aircraft Co.

Descriptors: (*Waveguides, Plasma medium), (*Electron beams, Plasma physics), (*Plasma medium, Wave transmission), Microwaves, Propagation, Magnetic fields, Cesium, Plasma oscillations.

The study is concerned with the problem of guided wave propagation and electron beam interaction in bounded systems containing a plasma. The model used in the study is a circular conducting guide partially filled with a uniform, stationary, zero-temperature plasma contained with a finite axial dc magnetic field. For the electron beam interaction study the beam is assumed to be of uniform cross section an perfectly neutralized. The modes which exist in such a system are studied from two points of view. First a detailed treatment using the quasi-static assumption is given. The second portion of the study of the modes is directed at including the effects of the divergence free fields which are neglected in the quasi-static approximation. The interaction of a neutralized electron beam with the modes in the finite plasma system is investigated by means of normal mode and variational techniques. The results of an experiment using a thermal cesium plasma which qualitatively verify the mode splitting and deformation predicted by the coupled mode theory are presented.

AD-605 266 Div. 8, 25
OTS Prices: HC $4.00/MF $1.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DIRECT CONVERSION OF PLASMA KINETIC ENERGY TO R. F. ELECTROMAGNETIC ENERGY.
Final rept.,
by E. Levi, J. Freidberg, and M. Sandler.
Aug 64, 134p PIBMRI-1224-64
Contract AF30 602 2980, Proj. 5573, Task 557303
RADC TDR64 265

Unclassified report

Descriptors: (*Energy conversion, Plasma physics), (*Plasma medium, Energy conversion), (*Microwaves, Generators), Electromagnetic waves, Radiofrequency, Propagation, Magnetohydrodynamics, Shock waves, Wave transmission, Plasma oscillations, Nonlinear systems, Electrons, Kinetic theory, Radar equipment.

An outline of the guiding principles and the work accomplished during the contract is presented. This work produced: (1) a novel mathematical technique which makes it possible to follow the development with time of disturbances and the formation of shocks in magnetized plasmas; (2) the discovery of hitherto unknown wave propagation modes which satisfy the two fluid nonlinear plasma dynamical equations; (3) the experimental detection of radiative modes in an impulsively excited toroidal discharge. (Author)

AD-605 269 Div. 8, 2
OTS Prices: HC $3.00/MF $0.75

Air Force Cambridge Research Labs., Bedford, Mass.
IONOSPHERIC PERTURBATIONS, SOLAR FLARES, AND GEOMAGNETIC STORMS, CORRELATIONS OBSERVED BY OBLIQUE LONG-RANGE HIGH-FREQUENCY PROBING.
Environmental research papers,
by Helen R. Baker and Alfred E. Reilly. Jun 64, 90p
Proj. 4649
AFCRL 64 455; AFCRL ERP22

Unclassified report

Descriptors: (*Ionospheric propagation, Radio interference), (*Solar flares, Radio interference), (*Magnetic storms, Radio interference), High frequency, Radio waves, Attenuation, Ionospheric disturbances, Correlation techniques.

Highly stable experimental hf radio links have been established over long paths by means of ionospheric propagation. The received signal has been analyzed and its variability characterized as to type. It has been possible to correlate the occurrence of certain types of characteristic variations with the occurrence of certain natural events such as solar flares and geomagnetic storms. Thus it appears that these phenomena are associated with variations in the electromagnetic properties of the ionosphere which perturb the signal propagating through it. Some cases appear to be easily explainable by means of fairly simple models whereas others are unexplained but are worthy of further study since their eventual explanation could be of great interest. (Author)

AD-605 271 Div. 8, 12
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
PLASMA PRODUCED ANTENNA PATTERN DISTORTION.
Physical sciences research papers,
by Daniel J. Jacavanco. Jun 64, 30p
Proj. 4642, Task 464202
AFCRL 64 511; AFCRL PSRP28

Unclassified report

Descriptors: (*Plasma sheath, Antenna radiation patterns), (*Antenna radiation patterns, Plasma sheath), Distortion, Atmosphere entry, Reentry vehicles, Antennas, Ionization, Mathematical analysis, Equations, Vacuum apparatus, Measurement, Theory, Satellite

Descriptors: (*Video amplifiers, Logarithmic amplifiers), (*Logarithmic amplifiers, Data-processing systems), Semiconductor devices, Radar pulses, Magnetic recording systems, Samplers, Theory, Circuits, Performance (Engineering), Magnetic tape, Data, Design, Electromagnetic pulses, Polarization, Radar.

A logarithmic amplifier has been designed for a data-sampling system used in connection with a radar system. The amplifier was designed primarily for pulse inputs of positive polarity with a pulse width of 1 to 2 microseconds and a pulse repetition frequency of 5.46 kc. One outstanding feature of the amplifier is its simplicity. The design incorporates no complicated feedback arrangements to achieve the desired logarithmic characteristics. (Author)

AD-605 223 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR IMPROVED RELIABILITY OF SOLID ELECTROLYTE TANTALUM CAPACITORS.
Quarterly rept. no. 4, 29 Mar-29 Jun 64,
by J. M. Eckfeldt and J. H. D. Folster. 29 Jun 64, 36p
Contract DA36 039AMC03621E

Unclassified report

Descriptors: (*Tantalum capacitors, Manufacturing methods), Reliability (Electronics), Powder metals, Performance (Engineering), Sintering, Life expectancy, Soldering, Manganese compounds, Oxides, Coatings, Industrial equipment, Tantalum, Electrolytes.

The processing of experimental lots through the production line continued in this period. A total of 59 lots have now been processed since the beginning of the contract. This report contains descriptions of the various experimental processing techniques incorporated in the latest 20 lots, including 8 lots of new ratings specified by the Technical Action Request proposed by Sprague in December, 1963. Also provided are preliminary data on Lots 28 through 36, 40, and 45 through 47 and life test data on Lots 1 through 9, 11 through 18, 21, and 23 through 30. Construction of another equipment was finished during this period. This was the fifth equipment to be completed under this contract. Two others are being built, and these are nearing completion. This report also includes a description of plans for the next quarter, a prediction of achievable reliability level, a list of reports issued, and a list of personnel hours expended during the period. (Author)

AD-605 225 Div. 8, 26
OTS Prices: HC $1.00/MF $0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR COLUMBIUM CAPACITORS.
Quarterly rept. no. 3, 26 Dec 63-26 Mar 64,
by J. H. D. Folster, E. E. Holley, and A. Whitman.
26 Mar 64, 12p
Contract DA36 039AMC01468E

Unclassified report

Descriptors: (*Capacitors, Niobium), (*Manufacturing methods, Capacitors), Electrolytic capacitors, Aging (Materials), Temperature, Capacitance, Voltage, Reliability (Electronics), Electrolytes, Life expectancy Oxides, Films.

During this quarter, construction of the four ratings required for the preproduction sample was continued. One of these ratings is now ready for testing. A program to improve the present yield levels was begun. Data obtained so far indicate that reduction of the aging temperature will not solve the problem of room temperature leakage current instability. Investigation of the effects of capacitance and voltage derating are under way. The final data from the reanodization studies indicate that variations in electrolytes and temperatures produce no significant quality improvements. (Author)

AD-605 237 Div. 8, 2
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INTERFERENCE ANTENNA,
by A. P. Molchanov and V. M. Vyatkina.
6 Aug 64, 6p
FTD TT64 479; TT 64 71289

Unclassified report

Unedited rough draft trans. of Russian patent no. 155507 (appl. no. 764608/26-9, 17 Feb 62).

Descriptors: (*Antennas, Radio astronomy) Panels (Structural), Reflectors, Focusing, Telescopes, Antenna components, Antenna configurations, Solar radiation.

The article describes an interference antenna for a radio telescope which has an irradiator and reflectors and is distinguished by the fact that for the purpose of increasing the resolving power and simplifying the transmission of energy to the irradiator it is designed in the form of a system of reflecting panels with a horizontal axis of revolution, and focusing vertical fixed panels with the irradiator located in their focus. (Author)

AD-605 262 Div. 8
OTS Prices: HC $4.00/MF $1.00

Shockley Transistor Div., Clevite Transistor, Palo Alto, Calif.
FOUR-LAYER DIODE DEVELOPMENT PROGRAM.
Final rept. for 7 Mar 63-7 Mar 64,
ed. by Walter Schroen. Jul 64, 148p
Contract AF30 602 2949, Proj. 5573, Task 557303
RADC TDR64 230

Unclassified report

Descriptors: (*Diodes (Semiconductor), Electrical properties), (*Electronic switches, Diodes (Semiconductor)), Silicon, Impurities, Diffusion, Epitaxial growth, Encapsulation, Modulators, Circuits, Reliability (Electronics), Thermal properties.

The report describes the design, development, fabrication and characterization of a high current, high voltage silicon four-layer diode. The main feature of the new four-layer diode is a voltage-current characteristic which is, prior to switching, similar to that of an avalanche diode. This property is achieved by short-circuiting one emitter-base junction. The short-circuiting takes place over the entire area in order to maintain uniform current conduction. Devices switching at 500 volts or higher, with peak pulse current capability of 1000 amperes or more are described. Since series operation of many devices is possible without complex dividing networks, the complexity of pulse modulator circuitry is reduced, and resonantly charged circuits can exhibit a high degree of operating reliability and temperature insensitivity. (Author)

AD-605 264 Div. 8
OTS Prices: HC $6.00/MF $1.25

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
CASCADE SYNTHESIS OF PASSIVE n-PORTS,

ratio at the output of the amplifier divided by the corresponding signal-to-noise ratio at the output of a filter matched to the pulse shape.) The degradation of signal-to-noise ratio caused by introduction of a quick recovery 'short' time constant is determined and shown experimentally. (Author)

AD-605 329 Div. 8
OTS Prices: HC $1.00/MF $0.50

Chatham Electronics Div., Tung-Sol Electric Inc., Livingston, N. J.
PRODUCTION ENGINEERING MEASURE FOR TYPE 7890 SUPER POWER HYDROGEN THYRATRON.
Quarterly progress rept. no. 9, 8 Mar-7 Jun 64, by C. L. Shackelford. 7 Jun 64, 20p
Contract DA36 039sc85984

Unclassified report

Descriptors: (*Thyratrons, Manufacturing methods), Hydrogen, Electron tube parts, Design, Cooling, Performance (Engineering), Radiofrequency power.

Initial tests have shown that the tube design used for four tubes meets the specification requirements including the added requirement of 30 amperes maximum cathode heater current. The use of fins to dissipate heat from the external grid rings has prevented the occurrence of deterimental primary grid emission during the aging of the tube. Changing the grid overlap from 0.160 inches to 0.190 inches made no difference in the firing characteristics. The greater overlap will provide a better design for production because minor misalignments between the grids will not be critical. (Author)

AD-605 330 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

General Electric Co., Owensboro, Ky.
C-BAND TRIODE-CAVITY OSCILLATORS, PRODUCTION ENGINEERING MEASURE.
Quarterly progress rept. no. 4, 1 Mar-29 May 64, by J. D. Marshall. 29 May 64, 48p
Contract DA36 039AMC01474E

Unclassified report

Descriptors: (*Triodes, Microwave oscillators), (*Microwave oscillators, Triodes), C-band, Performance (Engineering), Manufacturing methods, Test sets, Gain, Radiofrequency power, Life expectancy, Test equipment, Frequency shift.

Special test equipment is described. The test facility has been inspected and was found to be acceptable. The second engineering sample was submitted. Modifications to the test specification were discussed. Preparations for entering the preproduction phase have been completed. (Author)

AD-605 331 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Westinghouse Electric Corp., Washington, D. C.
500 WATT SILICON POWER TRANSISTOR.
Quarterly rept. no. 4, 1 May-31 Jul 64.
31 Jul 64, 37p
Contract NObsr91001, Proj. SR0080304, Task 9347

Unclassified report

Descriptors: (*Transistors, Silicon), (*Silicon, Transistors), Design, Encapsulation, Voltage, Surface properties, Alloys, Diffusion, Semiconductors, Tests, Impurities, Thermal diffusion.

Results of infra-red heat distribution studies are discussed. Detailed impurity profile design and geometrical mask configurations for the triple-diffused transistor are presented. Partial realization of the designed structure through fabrication work is shown. Models of the encapsulation are displayed. (Author)

AD-605 369 Div. 8
OTS Prices: HC $1.00/MF $0.50

Sperry Gyroscope Co., Great Neck, N. Y.
WIDE-BAND BEAM-TYPE PARAMETRIC AMPLIFIER.
Rept. for 1 Jan-30 Apr 64.
Aug 64, 22p NA-8210-8364-3
Contract AF30 602 3055, Proj. 5573, Task 557301
RADC TDR64 280

Unclassified report

Descriptors: (*Parametric amplifiers, X band), Microwave amplifiers, Broadband, Superhigh frequency, Pumping (Electronics), Gain, Noise (Radio), Standing wave ratios, Electron guns, Focusing, Helixes, Bandwidth, Waveguides, Electron tubes, Magnetic fields, Wave transmission, Signals.

An X-band, beam-type, parametric amplifier capable of operating in a twenty percent instantaneous band of frequency is under development. The device is a degenerate type with the pump frequency fixed at 21 Gc. The amplifier is to have an r-f gain of 25 db and a double-channel noise figure of 2 db. The device uses a modified bifilar helix as the coupler and a resonant quadrupolar circuit as the pump. Cold test data on r-f match, cavity Q, and circuit loss for the pump and coupler at their respective operating frequency ranges are presented. Best results on the coupler show that the VSWR is nominally at 2, and the cold insertion loss is about 4 db. Problems and results of the first and second devices constructed during the reporting period are discussed. The discussion includes d-c properties of electron gun and electron beam focusing, collector operation, Kompfner dip measurements, and signal transmission from coupler to coupler. Other problems such as coupler and pump synchronization, noise-stripping, and ion oscillation are discussed. Preliminary gain data shows that the electronic gain is only about 3 db for a pump power of 7 watts. (Author)

AD-605 376 Div. 8
OTS Prices: HC $5.00/MF $1.00

Shockley Transistor Div., Clevite Transistor, Palo Alto, Calif.
RESEARCH AND INVESTIGATION OF INVERSE EPITAXIAL UHF POWER TRANSISTORS.
Rept. for Jul 63-Jun 64,
by A. Goetzberger and R. M. Scarlett. Sep 64, 174p
Contract AF33 657 11403, Proj. 4460 Task 446001
AL TDR64 207

Unclassified report

Descriptors: (*Transistors, Ultrahigh frequency), Silicon, Epitaxial growth, Design, Diffusion, Impurities, Ion bombardment, Electrical properties, Packaging.

The report describes development work toward a 10 watt 500 Mc silicon npn epitaxial transistor. An extensive design theory permits calculation of important material and geometrical parameters to realize a given performance. Diffusion studies produced a greater understanding of the emitter dip effect, but lacked the control necessary for thin, heavily doped layers. Ion bombardment doping and epitaxial base growth are described; both these methods are promising but require further development. Devices were produced giving up to 7 watts at 500 Mc with 4 db

antennas, Rocket antennas, Guided missile antennas.

This report describes an experimental attempt to determine and measure the antenna pattern distortion produced by a layer of plasma. A brief theoretical and experimental summary of the problem is given, followed by the theory pertaining to this particular experimental geometry. The complete experiment, including the generation and measurement of the plasma, the vacuum system, and the antenna pattern measuring equipment is described in detail. Results are presented and compared with the theoretical predictions. Finally the merits of the experiment are weighed and future plans are given. (Author)

AD-605 293 Div. 8, 15
OTS Prices: HC $3.00/MF $0.75

Digital Computer Lab., Univ. of Illinois, Urbana.
AN INCREMENTAL CHARGE METHOD FOR THE ANALYSIS OF NONLINEAR CIRCUITS.
Master's thesis,
by Stephen John Nuspl. 6 Aug 64, 88p ILU-DCL-166
Contract Nonr1834 15 Unclassified report

Descriptors: (*Circuits, Numerical analysis), Nonlinear systems, Numerical methods and procedures, Transients, Electrical networks, Topology, Switching circuits, Transistors, Tunnel diodes, Programming (Computers).

Conventional numerical methods for nonlinear transient circuit analysis apply standard numerical procedures to the equations obtained from Kirchhoff's laws. In this thesis is developed a method of analysis in which only one of Kirchhoff's laws is forced to hold and the other is used to make numerical corrections. The method developed assumes that the current law holds and the voltage law may be violated. To obtain sufficiently simple numerical formulas, a circuit with a tree-type topology is assumed. Relying on this the basic charge distribution and node voltage calculation formulas are derived for the general branch which may consist of a resistance, a capacitance, an inductance, a voltage source or any series combination of these. Since this method favors current controlled nonlinear elements, an analogous but more restricted method for conveniently including votage-controlled devices is developed. A brief discussion of errors and their compensation and of stability is included. Because of the importance of diodes and transistors, the technique by which they can be efficiently analyzed by the method is developed. The advantages are that the method provides for the models the means for making numerical corrections. A technique by which transmission lines can be handled is also described. A program based on this method is presented through a brief description.

AD-605 300 Div. 8, 26
OTS Prices: HC $1.00/MF $0.50

Clevite Corp., Bedford, Ohio.
PRODUCTION ENGINEERING MEASURE FOR CERAMIC FILTERS.
Quarterly rept. no. 5, 30 Mar-29 Jun 64,
by A. Lungo. 29 Jun 64, 16p
Contract DA36 039AMC01471E
Unclassified report

See also AD-600 382.

Descriptors: (*Ceramic materials, Filters (Electromagnetic wave)), (*Filters (Electromagnetic wave), Ceramic materials), Manufacturing methods, High frequency, Disks, Electrodes, Tuning devices, Resonators, Material forming, Silver, Resonance, Coatings, Material removal.

The investigation of ring electrode application to the 4.3 Mc radial first overtone disk has been completed. The results of the various techniques investigated are discussed. A different approach to the screening technique is described which has improved the yield of 4.3 Mc disks having acceptable ring electrode patterns. The technique and initial results of tuning resonators for the 4.3 Mc filter requirements by tumble grinding are discussed. Difficulties encountered in the fabrication of the 6.0 Mc resonators are discussed. (Author)

AD-605 312 Div. 8, 26, 30
OTS Prices: HC $5.00/MF $1.00

General Electric Co., Owensboro, Ky.
RESEARCH ON RADIATION-RESISTANT HIGH-TEMPERATURE THERMIONIC CIRCUITRY.
Rept. for 3 Jun 63-May 64.
Aug 64, 188p
Contract AF33 657 11400, Proj. 4156, Task 415604
AL TDR64 187
Unclassified report

Descriptors: Thermionic emission, Integrated circuits), (*Integrated circuits, Electronic equipment), (*Modules (Electronics), Packaged circuits), High temperature research, Radiation damage, Electron tubes, Electron tube parts, Triodes, Diodes (Electron tubes), Capacitors, Resistors, Cathode followers, Oscillators, Printed circuits, Dielectrics, Computers, Material forming, Metals, Caramic material, Performance (Engineering), Microminiaturization (Electronics), Design.

This report discusses the progress and problems encountered in designing and fabricating radiation tolerant, high temperature, Thermionic Integrated MicroModule (TIMM) circuit elements and functional circuitry. The objectives of the program were to perform applied research toward the evaluation and processing of materials exhibiting stable and superior physiochemical characteristics over the temperature range up to 600C, and to incorporate such materials into devices, modules and integrated circuits for reliable operation in severe mechanical, thermal and radiation environments. Functional circuits, fabricated to demonstrate feasibility of the TIMM concept, have been designed to operate at 580C. This program has shown that many opportunities still exist for further size and weight reductions by the combination of individual circuit elements into multi-structure, functional elements.

AD-605 323 Div. 8, 30
OTS Prices: HC $3.00/MF $0.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
RANDOM NOISE CONSIDERATIONS IN THE DESIGN OF MAGNETIC FILM SENSE AMPLIFIERS,
by H. Blatt. 17 Aug 64, 80p LL-GR-1964-6
Contract AF19 628 500
ESD TDR64 365
Unclassified report

Descriptors: (*Magnetic core storage, Noise), (*Thin films (Storage devices), Noise), (*Amplifiers, Noise), Transistor amplifiers, Signal-to-noise ratio, Electronic switches, Resistance (Electrical), Radiofrequency filters, Communication theory.

A model of a magnetic film sense system is presented. Using the model the mean time between false readouts due to random noise is determined as a function of the system parameters; total magnetic flux switched, switching time, sense line resistance, amplifier noise factor and linear amplifier filter efficiency. (The filter efficiency with respect to a given input pulse shape is the signal-to-noise

AD-605 393 Div. 8, 12, 14, 26
OTS Prices: HC $6.00/MF $1.25

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
PROCEEDINGS OF THE OSU-RTD SYMPOSIUM ON ELECTROMAGNETIC WINDOWS (7th), 2-4 JUNE 1964. VOL. V: PAPERS SUBMITTED FOR THE PROCEEDINGS ONLY,
comp. by Alan I. Slonim. 4 Jun 64, 215p
Contract AF33 615 1081

Unclassified report

Also see AD-605 392

Descriptors: (*Radomes, Symposia), (*Waveguide windows, Symposia), Electrical properties, Design, Dielectrics, Materials, Construction, Wave transmission, Aerodynamic heating, Supersonic flight, Ceramic materials, Plasma sheath, Dielectrics, Feasibility studies, Supports, Collimators, Configuration, Measurement, X-band, K-band, Plastic coatings, Coatings, Glass textiles, Laminates, Honeycomb cores, Sandwitch construction, Inflateable structures, Guided missile components.

The papers presented in this report were submitted for the Seventh Symposium on Electromagnetic Windows and are published in five volumes. Volume 5 includes the general field of radome design, performance, characteristics, and construction material.

AD-605 397 Div. 8, 5
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
COMPOSITE CODED COMMUNICATIONS,
by C. S. Lorens and D. J. Braverman.
May 64, 33p TDR-269(4540-80)-2
Contracts AF04 695 269, N123 60530 34804A
SSD TDR64 102

Unclassified report

Study made in cooperation with the California Inst. of Tech., Pasadena, Calif.

Descriptors: (*Coding, Communication systems), (*Communication systems, Coding), Synchonization (Electronics), Decoding, Signal-to-noise ratio, Band width, Gain, Modulation, Radiofrequency interference, Correlators, Statistical processes, Probability, Communication theory.

This paper presents an investigation of the use of composite codes for the synchronization coded, coherent communication systems. The paper considers composite transmitter codes that minimize synchronization time and composite receiver codes that maximize processing gain. Bounds on synchronization time are obtained as functions of the code uncertainty, probability of synchronization error, signal-to-noise ratio, and composite code degree. These bounds are compared with similar bounds on acquisition time required to construct the composite code when only the periods of the components are known. (Author)

AD-605 400 Div. 8, 12, 14, 17, 26
OTS Prices: HC $6.00/MF $1.50

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
PROCEEDINGS OF THE OSU-RTD SYMPOSIUM ON ELECTROMAGNETIC WINDOWS (7th), 2-4 JUNE 1964. VOL. II, SESSION III: ELECTRICAL DESIGN. SESSION IV: STRUCTURAL DESIGN FOR LARGE RADOMES.
comp. by Alan I. Slonim. 1964, 283p
Contract AF33 615 1081

Unclassified report

Also see AD-605 390

Descriptors: (*Radomes, Symposia), (*Waveguide windows, Symposia), Supersonic flight, Aerodynamic heating, Electrical properties, Dielectrics, Materials, Slot antennas, Antennas, Radar antennas, Aircraft antennas, Design, Antenna configurations, Sandwich construction, Ceramic materials, Foams, Structural properties, Metals, Silver, Glass textiles, Reinforcing materials, Laminated plastics, Plastics, Composite materials, Aluminum, Coatings, Honeycomb cores, Inflatable structures, Guided missile components.

The papers presented in this report were submitted for the Seventh Symposium on Electromagnetic Windows and published in five volumes. Vol. 2 concerns Electrical Design and Structural Design for Large Radomes.

AD-605 418 Div. 8, 25
OTS Prices: HC $4.00/MF $0.75

Microwave Devices Lab., Univ. of Utah, Salt Lake City.
MICROWAVE DEVICE AND PHYSICAL ELECTRONICS LABORATORY CONSOLIDATED QUARTERLY REPORT FOR THE PERIOD APRIL 1-JUNE 30, 1964.
30 Jun 64, 141p MDL-Q9
Contracts Nonr1288 05, AF04 693 439

Unclassified report

See also AD-601 896.

Descriptors: (*Microwave Equipment, Optical phenomena), (*Electron beams, Microwave frequency), (*Quantum mechanics, Microwave frequency), (*Plasma physics, Microwave frequency), Backward wave oscillators, Dielectrics, Circuits, Cyclotron waves, Waveguides, Lasers, Tunneling (Electronics), Masers, Plasma oscillations, Rocket motors, Exhaust gases, Superconductivity.

Contents: A 36-40 kMc multiple-ladder circuit backward-wave oscillator; Dielectric slow-wave circuits; Rotating beam devices; Cyclotron-wave device; Multiple-beam interactions; Magneto-electric beam compression; Transverse beam waves; A two-millimeter backward-wave oscillator; Irradiated laser materials; Tunneling studies; Millimeter wave masers; Gas laser studies; Waves in plasmas; Plasma generation and measurements; Plasma for a coupling medium; Rocket exhaust studies; Superconductivity.

AD-605 419 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Coordinated Science Lab., Univ. of Illinois, Urbana.
OPTIMAL MATCHING OF NONLINEAR n-PORT NETWORKS,
by R. A. Rohrer and J. P. Herner. Jul 64, 24p
CSL-R-221
Contract DA28 043AMC00073E

Unclassified report

Descriptors: (*Electrical networks, Optimization), (*Tunnel diodes, Networks), Nonlinear systems, Calculus of variations, Power, Voltage, Topology, Circuits.

The classical calculus of variations is applied to find the conditions for maximum energy transfer in nonlinear n-port networks. The general matching problem is discussed, and the sufficient conditions for the optimal load network are given in terms of the time domain behavior of the net-

gain. An important device principle, the shorted emitter, is described. Methods of evaluating contact resistance and designing control structures for diffusion evaluation are discussed. (Author)

AD-605 389 Div. 8, 14, 17, 26
OTS Prices: HC $5.00/MF $1.00

Vallecites Atomic Lab., General Electric Co., Pleasanton, Calif.
RESEARCH AND DEVELOPMENT PROGRAM OF THERMIONIC CONVERSION OF HEAT TO ELECTRICITY, VOLUME I.
Final technical summary rept. no. 3, 31 Oct 63-30 Jun 64, by R. H. Bristow, L. N. Grossman, and A. J. Kaznoff.
30 Jun 64, 178p GEST-2035
Contract NObs88578, Projs. SR007 1201, ARPA Order 219, Tasks 1, 2

Unclassified report

Descriptors: (*Thermionic converters, Electric insulation), (*Electric insulation, Coatings), (*Corrosion inhibition, Coatings), Energy conversion, Aluminum compounds, Oxides, Electrical conductance, Metal coatings, Refractory coatings, Refractory metal alloys, Tungsten, Molybdenum, Cermets, Nickel, Niobium, Composite materials, Bonding, Sintering, Ceramic materials, Seals (Stoppers), Corrosion, Cesium, Vapors, High-temperature research, Life expectancy, Environmental tests, Tantalum, Brazing, Palladium alloys, Cobalt alloys, Nickel alloys, Chromium alloys, Chromium, Iron, Palladium, Platinum.

The electrical conductivity of Lucalox alumina has been measured under conditions representing the operational environment of a thermionic diode. Tungsten and molybdenum based coatings have been developed, metallized to alumina and tested in cesium vapor for over 2000 hours. Multilayered cermets were prepared but failed to prove electrically insulating. Alumina-to-nickel and Alumina-to-niobium shim seals were prepared and tested for extended periods of time. The joining of various refractory metals to metallized alumina using diffusion bonding, brazing, and braze-diffusion bonding techniques were investigated. The cesium corrosion resistance of various materials and seals was determined at 1000C. (Author)

AD-605 390 Div. 8, 12, 14, 26
OTS Prices: HC $4.00/MF $1.00

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
PROCEEDINGS OF THE OSU-RTD SYMPOSIUM ON ELECTRO-MAGNETIC WINDOWS (7th), 2-4 JUNE 1964. VOL. I: SESSION I: OBJECTIVES AND NEW TECHNIQUES. SESSION II: MATERIALS FOR HIGH TEMPERATURE APPLICATIONS,
comp. by Alan I. Slonim. 4 Jun 64, 148p
Contract AF33 615 1081

Unclassified report

Descriptors: (*Waveguide windows, Symposia), (*Radomes, Symposia), Materials, Processing, Boron compounds, Nitrates, Material forming, Physical properties, Microstructure, Waveguides, Refractory materials, Reentry vehicles, Antennas, Aerodynamic heating, Ablation, High-temperature research, Aluminum compounds, Reports, Phosphates, Electromagnetic waves, Wave transmission, Design, Ceramic materials, Silicon compounds, Nitrides, Plastics, Graphite, Composite materials, Guided missile components.

The papers presented in this report were submitted for the Seventh Symposium on Electromagnetic Windows and are published in five volumes as follows: Vol. 1 - Objectives and New Techniques, Materials for High Temperature Applications; Vol. 2 - Electrical Design, Structural Design for Large Radomes; Vol. 3- Fabrication and Testing of Airborne Radomes, Hypersonic Environment; and Vols. 4 and 5 - Oral papers received too late for inclusion in Vols. I, II, and III. Papers submitted for the proceedings only.

AD-605 391 Div. 8, 12, 14, 26
OTS Prices: HC $6.00/MF $1.50

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
PROCEEDINGS OF THE OSU-RTD SYMPOSIUM ON ELECTROMAGNETIC WINDOWS (7th) 2-4 JUNE 1964. VOL. III: SESSION V: FABRICATION AND TESTING OF AIRBORNE RADOMES, SESSION VI: HYPERSONIC ENVIRONMENT,
comp. by Alan I. Slonim. 4 Jun 64, 292p
Contract AF33 615 1081

Unclassified report

Also see AD-605 400

Descriptors: (*Radomes, Symposia), (*Waveguide windows, Symposia), Airborne, Supersonic flight, Antennas, Materials, Erosion, Water, Dielectrics, High temperature research, Ceramic materials, Sandwich construction, Manufacturing methods, Design, Construction, Refractory materials, Reentry vehicles, Testing, Ablation, Plastics, Laminated plastics, Glass textiles, Composite materials, Filament wound construction, Bonding, Adhesives, Casting, Guided missile components.

The papers presented in this report were submitted for the Seventh Symposium on Electromagnetic Windows and are published in five volumes. Vol. 3 concerns Fabrication and Testing of Airborne Radomes and Hypersonic Environment.

AD-605 392 Div. 8, 12, 14, 26
OTS Prices: HC $6.00/MF $1.25

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
PROCEEDINGS OF THE OSU-RTD SYMPOSIUM ON ELECTROMAGNETIC WINDOWS (7th), 2-4 JUNE 1964. VOL. IV: ORAL PAPERS RECEIVED TOO LATE FOR INCLUSION IN VOLS. I, II, AND III. PAPERS SUBMITTED FOR THE PROCEEDINGS ONLY,
comp. by Alan I. Slonim. 4 Jun 64, 214p
Contract AF33 615 1081

Unclassified report

Also see AD-605 391.

Descriptors: (*Radomes, Symposia), (*Waveguide windows, Symposia), Re-entry vehicles, Aerodynamic heating, Telemetering antennas, Materials, Manufacturing methods, Erosion, Water, Construction, Microwaves, Measurement, Interferometers, Microwave relay systems, Antennas, Testing, Ceramic materials, Glass textiles, Steel, X-band, Very high frequency, Finishes and Finishing, Guided missile components.

The papers presented in this report were submitted for the Seventh Symposium on Electromagnetic Windows and are published in five volumes. Volume 4 concerns the general fields of radome design, construction, and applications.

AD-605 435 Div. 8
OTS Prices: HC $2.00/MF $0.50

Illinois Univ., Urbana.
SPHERICAL REFLECTOR FABRY-PEROT RESONATORS AT CENTIMETER WAVELENGTHS.
Master's thesis,
by Robert Jules Panneton. 1964, 47p
Unclassified report

Descriptors: (*Microwave equipment, Cavity resonators), (*Cavity resonators, X band), Reflectors, Spheres, Interferometers, Microwave frequency, Design, Construction, Operation, Frequency meters.

Resonators consisting of a single concave spherical reflector and a plane reflecting surface separated by distances up to the radius of curvature of the spherical reflector are considered. The purpose was to investigate the possibility of extending the theory of the spherical mirror Fabry-Perot resonator to wavelengths in the X-band region. A spherical mirror Fabry-Perot Interferometer (Fabry-Perot Spherique) was designed, constructed, and operated. Measurements were made at wavelengths between 8.2-12.4 Gc where microwave equipment was conveniently available. Preliminary measurements of the microwave performance of a spherical plate FP Interferometer are presented and compared with theory. The major part of the experimental program was devoted to demonstrating the feasibility of building an acceptable cavity at such relatively long wavelengths (3 cm) and to showing that the predicted theoretical results can be achieved in practice. (Author)

AD-605 437 Div. 8, 25
OTS Prices: HC $3.00/MF $0.50

Lehigh Univ., Bethlehem, Pa.
THE PIN DIODE AS A MICROWAVE MODULATOR.
Master's thesis,
by Martin Clark Faga. 1964, 51p
Unclassified report

Descriptors: (*Diodes (Semiconductor), Modulators), (*Modulators, Microwave frequency), Modulation, Microwave equipment, Circuits, X band, L band, Radiofrequency power, Coaxial cables, Waveguides, Performance (Engineering).

Increased use of radio communication has brought use of higher and higher frequencies in the electromagnetic spectrum. While transmission frequencies have risen, intelligible and useful information is still contained in audio and other low frequency signals. Hence modulation, the electronic process of mixing these two signals, is a fundamental part of this development. Unfortunately, modulation methods used with low frequency carrier circuits do not work well, if at all, at microwave carrier frequencies. The PIN diode is a simple semiconductor device whose properties lend it to effective use as a modulator at microwave frequencies. This paper is concerned with a brief theoretical presentation of actual modulating circuits and discussion of their operation and results obtained. (Author)

AD-605 449 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Case Inst. of Tech., Cleveland, Ohio.
NETWORK SYNTHESIS THROUGH HYBRID MATRICES.
Scientific rept. no. 4,
by R. J. Duffin, D. Hazony, and N. Morrison. 18 Aug 64, 46p
Contract AF19 628 1699, Proj. 5635, Task 563502
AFCRL 63 568 Unclassified report

Descriptors: (*Electrical networks, Synthesis), (*Matrix algebra, Electrical networks), Transformers, Networks, Electrical impedance, Combinatorial analysis, Complex variables.

It is shown that the hybrid parameter matrix of a passive n-port network is a positive real matrix function. The hybrid, chain and immittance parameter matrices all have the same degree. The concept of combinatorial equivalence is extended from the linear programming field to network synthesis. An n-port extension of the Brune synthesis procedure is given. A novel concept of degree enumeration is given. (Author)

AD-605 472 Div. 8
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
LENS ANTENNA WITH ROLLING BEAM IN A WIDE SECTOR,
by Yu. A. Zaitsev. 15 Jul 64, 14p
FTD TT64 628; TT 64 71320
Unclassified report

Unedited rough draft trans. of Radiotekhnika (USSR) 1963, v. 18, no. 11, p. 20-26.

Descriptors: (*Lens antennas, Antenna radiation patterns), (*Antenna radiation patterns, Lens antennas), Luneberg lens antennas, Antenna configurations, Beams (Electromagnetic), Scanning, Conical bodies, Wave transmission, Mathematical analysis, Design, USSR.

This report is devoted to the calculation of an antenna, assuring radiation pattern control of 'pencil' type at greater speed and in broader limits. The antenna represents a side surface of a truncated cone with the 'focusing' structure applied to it. To sweep the side surface of a cone a Luneberg type flat lens is used. (Author)

AD-605 478 Div. 8, 25
OTS Prices: HC $5.00/MF $1.00

Electronic Defense Labs., Mountain View, Calif.
RESEARCH OF TECHNIQUES FOR LIGHT MODULATION DETECTION. PART I. AMPLITUDE DEMODULATORS.
Final rept., pt. 1, 15 May 62-15 May 63,
by B. J. McMurtry, D. E. Caddes, R. Targ, A. E. Siegman, and R. T. McKenzie. Jun 64, 156p
Contract AF33 657 8995, Proj. 4156, Task 415610
AL TDR64 181 P1
Unclassified report

Also see AD-410 264

Descriptors: (*Light, Demodulation), (*Amplitude modulation, Light), (*Phototubes, Microwave equipment), Light communication systems, Traveling wave tubes, Lasers, Broadband, Microwave frequency, Photomultipliers, Electron guns, Light transmission, Velocity, Demodulators, Noise (Radio), Electron density, Photocathodes, Design, Construction, Tests.

The results of a one-year applied research program on the demodulation of amplitude-modulated (AM) light are presented. Sufficient information is provided for the detailed understanding, design, and use of traveling-wave microwave phototubes (TWPs), the most promising detector for broadband-modulated light. The report includes: (1) the idealized analysis which first pointed out the more important TWP design considerations and operating characteristics; (2) a more complete computer-aided analysis which gives detailed information on the

work. The optimal match for a tunnel diode is given as a specialization of the general results. (Author)

AD-605 420 Div. 8, 15
OTS Prices: HC $2.00/MF $0.50

Coordinated Science Lab., Univ. of Illinois, Urbana.
AN EXTENSION OF DASHER SYNTHESIS,
by Bruce D. Elliott. Aug 64, 45p CSL-R-231
Contracts DA28 043AMC00073E, AF49 638 1383
Unclassified report

Descriptors: (*Synthesis, Electrical networks), (*Electrical networks, Synthesis), Complex numbers, Inequalities, Functions, Matrix algebra, Networks, Electri terminals.

A study is given of conditions under which a specified nonminimum phase transfer function may be realized as a cascade of common terminal RC structures, each of which realizes a pair of complex zeros. Specifically, conditions are derived which must be satisfied by a driving point admittance if a section producing a pair of zeros in a portion of the right half-plane is to be removed and an RC function is to remain. The simplest section parameters consistent with this objective are chosen and inequalities are derived which assure positive solutions for the unspecified constants. A technique is also derived for the conversion of the complete admittance description of a common terminal section to a physical network based on node insertion in the admittance matrix and sufficient inequalities are given. (Author)

AD-605 421 Div. 8, 15
OTS Prices: HC $2.00/MF $0.50

Coordinated Science Lab., Univ. of Illinois, Urbana.
PSEUDO CUTS AND THEIR APPLICATIONS,
by Wataru Mayeda. Jul 64, 29p CSL-R-233
Contracts DA28 043AMC00073E, AF49 638 1383
Unclassified report

Descriptors: (*Set theory, Circuits), (*Circuits, Set theory), Graphics, Theorems, Groups (Mathematics), Networks.

AD-605 426 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

Coordinated Science Lab., Univ of Illinois, Urbana.
INITIATION OF ELECTRICAL BREAKDOWN IN ULTRAHIGH VACUUM,
by D. Alpert, D. A. Lee, E. M. Layman, and H. E. Tomaschke. Aug 64, 68p CSL-R-234
Contract DA28 043AMC00073E
Unclassified report

Descriptors: (*Electrodes, Reliability (Electronics)), Field emission, Electric fields, Electric currents, Tungsten, Vacuum.

Existing theories for the initiation of electrical breakdown are reviewed, together with the experimental observations on which they are based. Experiments described have extended the available data on electrical breakdown between broad area electrodes under ultrahigh vacuum conditions. The results are interpreted on the basis of a single picture which explains and relates the phenomena of predischarge currents and the initiation of breakdown. Based on field emission from sharp submicroscopic points, this picture predicts breakdown when the local electric field at the cathode reaches a critical value. The local field, which for broad area electrodes may be much larger than the average field, is deduced from observations of field emission prior to breakdown. When properly analyzed, data for tungsten electrodes from this research and several others indicate a value for the electrical field at breakdown which is independent of gap spacing or geometrical configuration for voltages up to 250 kV. (Author)

AD-605 429 Div. 8
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
CONSTRUCTION AND PERFORMANCE OF HIGH CURRENT AIR-GAP SWITCHES,
by Rudolf G. Buser and John J. Sullivan. Jul 64, 30p
Task 1A0 10501B010 34
USAEL TR2484
Unclassified report

Descriptors: (*Electronic switches, Design), Electrodes, Electric currents, Voltage, Inductance, Transformers, Atmospheric electricity, Plasma physics, Electronics, Performance (Engineering).

From an experimental study of the properties of single-channel air-gap switches, the design and performance of efficient multi-channel switches are derived. These switches have the ability to handle currents of several million amperes, to hold-off high voltages, and to switch in times of the order of 10 to the minus 8th power seconds, with an inductance in the order of 10 to the minus 8th power henries. (Author)

AD-605 432 Div. 8, 30
OTS Prices: HC $4.00/MF $1.00

Remington Rand Univac Div., Sperry Rand Corp., St. Paul, Minn.
INTEGRATED CIRCUIT STUDY.
Final rept. 1 Jun 63-1 Jul 64.
Aug 64, 142p PX-3266
Contract NObsr89341
Unclassified report

See also AD-419 156.

Descriptors: (*Integrated circuits, Computers), Diodes (Semiconductor), Reliability (Electronics), Stresses, Failure (Mechanics), Tests, Standards, Performance (Engineering).

The possibility of replacing state-of-the-art multi-chip circuits currently used in the CP667 computer with newly developed monolithic circuits was investigated. Multi-chip units of the variety used in the CP667 from two manufacturers were investigated. To further investigate monolithic characteristics, three other monolithic circuit types, two from a third manufacturer, were studied. One unit of each of the ten types was opened for structural analysis. Similarly each unit which failed catastrophically during the various stresses was opened and the cause of failure was determined. Stresses included a series of incoming tests to establish a basis of comparison, operating life tests, a series of environmental stresses, and performance testing. On the basis of the tests it was concluded that the Westinghouse monolithic DTL circuits approached the standard required for multi-chip circuits in the CP667. Failure analysis revealed that most failures were associated with wire bonds. The larger number of leads in multi-chip circuits increased the chances of failure in these units. (Author)

frequency power, Gain, Electron guns, Waveguide windows, Bandwidth, Transmission lines, Coupling circuits, Circuit interconnections, Liquid cooled, Attenuators, Waveguides, Design, Tests.

The applied research on a high power V-band 55 Gc amplifier chain was divided into two phases. Phase I resulted in the design of a CW 1 watt, 30 db amplifier traveling wave tube designated STV-197. Design studies were performed toward a 50 KW high gain, broadband traveling wave amplifier designated STV-198. No further work on the STV-197 was performed on Phase II and no tubes were built. Phase II efforts were concluded with the construction and testing of three experimental pulse final amplifier tubes, but for a 10 KW reduced objective. The data obtained from one of the experimental tubes indicated promise of meeting the specifications. Mechanical type failures caused the three experimental tubes to fail. There is a need for additional work in the areas of: circuit support to maintain straightness, liquid cooling of the circuit, refinement of the rf window for kilowatt power level applications, and reduction of size and weight. (Author)

AD-605 528 Div. 8, 7, 30
OTS Prices: HC $1.00/MF $0.50

Giannini Controls Corp., Duarte, Calif.
BRUSHLESS PRECISION POTENTIOMETER,
Interim development rept. for 5 May-19 Jul 64.
31 Jul 64, 18p GCC-ER-8645-1
Contract NObsr91175

Unclassified report

Descriptors: (*Potentiometers, Photoelective effect), Photoconductivity, Photoelectric materials, Cadmium compounds, Sulphides, Photosensitivity, Metal films, Design, Processing, Voltage.

The purpose of the program is to perform studies leading to the fabrication of eight brushless precision potentiometers. A detailed description of the preparation of cadmium sulphide photoswitches and results of preliminary tests to determine proper sensitizing techniques are described. Also included are preliminary results of tests to determine a correlation between photoconductivity and photosensitive surface gap geometry. The results of the tests performed to date, that are described in the report, have not furnished any conclusive data.

AD-605 534 Div. 8, 30
OTS Prices: HC $2.00/MF $0.50

Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
THEORETICAL PATTERNS AND MODEL DATA OF A WARLA DESIGN.
Technical rept. no. 5,
by John W. Greiser. Aug 64, 50p RRL-255
Contract NObsr89229

Unclassified report

Descriptors: (*Antennas, Design), (*Models (Simulations), Antennas), Log periodic antennas, Antenna radiation patterns, Antenna configurations, Mathematical models, Digital computers, Scattering, Model tests, Medium frequency, High frequency, Very high frequency, Antenna lobes, Performance (Engineering), Experimental data, Direction finding.

Radiation patterns measured on a 500:1 scale model are compared to patterns calculated on a digital computer. The degree of correlation found over the lowest band of the three band system is then a measure of prediction validity of the program over the other frequency ranges. Reasonably good correspondence is found. A total of 144 log-periodic elements of varying size are spaced at 2 1/2 degree increments around a 1210 feet diameter circle. Over the range 2-32 Mc, it is expected that the first sidelobe will never exceed -10 db, while the azimuthal beamwidth will decrease from 34 degrees to 1 1/2 degrees. A high front-to-back ratio is maintained at all frequencies. (Author)

AD-605 537 Div. 8
OTS Prices: HC $1.00/MF $0.50

Electromagnetic Technology Corp., Palo Alto, Calif.
FREQUENCY CONVERTER UNITS FOR L-BAND, S-BAND, C-BAND, AND X-BAND.
Interim development rept. no. 14, 1-31 Aug 64,
by William A. Edson and Lyle C. Bacon. 15 Sep 64, 14p
Contract NObsr89536, Proj. SF0100201, Task 9294

Unclassified report

Also see AD-603 765.

Descriptors: (*Frequency converters, Design), L band, S band, C band, X band, Diodes (Semiconductor), Waveguides, Klystrons, Oscillators, Crystal mixers, Standing wave ratios, Tests.

Improvements were made on the L-band double-balanced converter to provide some margin over the specification. Tests of the up and down converter at full signal level were also conducted. Fabrication of two versions of an S-band converter was completed. Tests show that both units are promising and it should be possible to achieve all specifications with one or the other soon. Development work on the X-band double-balanced converter has proceeded with design, fabrication and testing of components. Investigations of the spurious frequency output of the L-band converter were conducted and it was concluded that performance is satisfactory.

AD-605 543 Div. 8
OTS Prices: HC $4.00/MF $1.25

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
DESIGN AND ANALYSIS OF PULSED MAGNETIC CORE CIRCUITS,
by Wilbert H. Aldrich. Jun 61, 134p E-987
Contract AF04 647 303, Proj. 52 156

Unclassified report

Descriptors: (*Switching circuits, Magnetic cores), (*Magnetic cores, Switching circuits), Magnetic coils, Hysteresis, Magnetic properties, Resistance (Electrical), Ferromagnetism, Theory, Design, Analysis.

The consideration of 'square loop' magnetic core switching waveforms is approached by separating the calculations into two parts, switching due to reversible flux change and switching due to irreversible flux change. A comparison is made between conventional core switching equations for irreversible flux change and both the actual case and the equations arising from the use of the Chen-Papoulis variable resistance function. A graphical means of calculating switching waveforms is presented which is applicable to linear, resistive core loading. Switching waveforms for reversible flux change are calculated by use of conventional circuit theory and an average coefficient of coupling between core windings. The variation of coupling with the variation of geometrical position of the windings and the state of magnetization of the core is considered. (Author)

effects of the various beam-circuit parameters and operating conditions; and (3) an analysis of the electron gun region, with emphasis on velocity spread and current density effects. The results of a detailed experimental analysis of the TWP are presented, providing both verification of the more complete theoretical treatment and information on generally-useful photodetector test techniques. Experimental data are given on several other types of photodetectors. A discussion of the design and construction of TWPs with S-1 photocathodes contains material of practical importance to TWP builders.

AD-605 490 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
ENHANCED MICRO-MODULE INTERCONNECTIONS. AN HERMETIC PACKAGING SYSTEM FOR THE INTEGRATION OF MICRO CIRCUITS.
Quarterly rept. no. 4, 1 Apr-30 Jun 64, by R. Collins and D. J. Garibotti. 30 Jun 64, 47p
HSER-3027
Contract DA36 039AMC03620E
Unclassified report

Rept. on Production Engineering Measure. Also see AD-602 271.

Descriptors: (*Integrated circuits, Manufacturing methods), (*Microminiaturization (Electronics), Integrated circuits), Welding, Electron beams, Hermetic seals, Modules (Electronics), Semiconductor devices, Packaging, Packaged circuits, Brazing, Electroplating, Ceramic materials, Environmental tests, Thermal stresses, Shock (Mechanics), Vibration, Thin films (Storage devices), Production.

Fifteen engineering model design enhanced micro modules were assembled and tested under the following environments; thermal shock, vibration, mechanical shock, and leak tests. Ten ten-stage binary divider enhanced micro modules were also assembled and tested. These modules demonstrated the compatibility of the interconnection-packaging system with solid state integrated circuits. The electroplated portion of the terminated microwafer was increased in length from .005 to .009 inches to eliminate opens which were occurring during stack welding. The microwafer stack welding machine in conjunction with the automatic electron beam programmer was installed within the electron beam machine and its functions checked. All eleven brazing fixtures required for the fabrication of the header-transfer wafers are operational. Significant strides toward the goal of developing the laboratory, electroplating facility into a production facility were also made during this period.

AD-605 497 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Lansdale Div., Philco Corp., Pa.
RESEARCH AND DEVELOPMENT TO OBTAIN SEMICONDUCTOR DIODES FOR ELECTRONIC TUNING.
Interim engineering rept. no. 4, 27 Mar-26 Jun 64. 26 Jun 64, 38p Philco-R-182
Contract NObsr89508, Proj. SR 008 301, Task 9351
Unclassified report

Also see AD-602 027

Descriptors: (*Diodes (Semiconductor), Tuning devices), (*Tuning devices, Diodes (Semiconductor)), Epitaxial growth, Silicon compounds, Silicon, Electric fields, Hydrochloric acid, Etched crystals, Crystals, Microstructure, Electrical properties, Voltage, Manufacturing methods, Processing, Surface properties, Semiconductors.

Use of the guard-ring structure, plus processing changes to lower to electrical field at the periphery of the junction, has resulted in a significant increse in the level of breakdown voltage attained in diodes. The feasibility of fabricating large-area planar silicon diodes which meet all of the objective electrical specifications for Devices 'A' and 'B' has been established, and in-specification devices have been delivered. Because of the inherent advantages of the planar process, diodes made by this refined planar process are superior to devices made by other technologies. Specifications for pilot production of the required final engineering samples have been established. (Author)

AD-605 512 Div. 8, 25
OTS Prices: HC $6.00/MF $1.50

Electronic Defense Labs., Mountain View, Calif.
RESEARCH ON TECHNIQUES FOR LIGHT MODULATION DETECTION; PART II: FREQUENCY DEMODULATORS.
Final rept., pt. 2, 15 May 63-15 May 64, by E. O. Ammann, S. E. Harris, and R. Targ. Jun 64, 290p
Contracts AF33 657 8995, AF04 695 305, Proj. 4156, Task 41510
AL TDR64 181 P2
Unclassified report

Study made in cooperation with Stanford Univ. under contract to Air Force Systems Command. See also AD-605 478.

Descriptors: (*Light, Demodulation), (*Frequency modulation, Light), (*Phase modulation, Light), (*Phototubes, Microwave equipment), Light communication systems, Refraction, Discriminators, Microwave frequency, Demodulators, Crystals, Noise (Radio), Signal-to-noise ratio, Lasers, Broadband, Design, Construction, Tests.

The results of a one-year program on the demodulation of frequency-modulated (FM) or phase-modulated (PM) light are presented. Theoretical and experimental studies were made both of direct demodulation and heterodyne demodulation. A technique employing conversion of FM to AM via a birefringent device with subsequent detection by a traveling-wave phototube is used for the demodulation method. The report deals with techniques and devices for converting FM (and PM) to AM at optical frequencies. Comprehensive analyses and discussions are given on two simple birefringent devices, the birefringent discriminator and the optical ratio detector, devices capable of converting FM to AM and PM to AM, respectively. The use of multicrystal devices in demodulators is treated. Included are two optical network synthesis techniques for realizing birefringent devices having arbitrarily specified transfer functions. The conclusions reached in this program are stated, and the major contributions are summarized.

AD-605 526 Div. 8
OTS Prices: HC $4.00/MF $0.75

Sperry Gyroscope Co., Great Neck, N. Y.
APPLIED RESEARCH ON A HIGH-POWER V-BAND AMPLIFIER.
Final engineering rept. for 1 May 61-30 Sep 63. 30 Sep 63, 119p NA-8220-8367
Contract AF33 616 8292, Proj. 4156, Task 415603
AL TDR64 203
Unclassified report

Descriptors: (*Amplifiers, V-band), (*Traveling wave tubes, V-band), Broadband, Electrical properties, Radio-

AD-605 585 Div. 8, 5
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DEVICE FOR AUTOMATIC MAINTAINING THE LEVEL OF THE OUTPUT CAPACITY OF A TRANSMITTER,
by N. A. Olenev, I. M. Korolev, and S. I. Vopilkin.
18 Mar 64, 8p
FTD MT63 275; TT 64 71331

Unclassified report

Edited machine trans. of Russian patent 148875 (appl. 697000/26, 9 Feb 61) Author's certificate cl. 21a4, 70, gr. 89 (pub. in Byulleten' Izobretenii i Tovarnykh Zakov (USSR) 1962, no. 4).

Descriptors: (*Radio transmitters, Automatic gain control), (*Single sideband communication systems, Telephone transmitters), High frequency, Intermediate frequency, Modulation, Signal-to-noise ratio, Design, Circuits, Electronic equipment, Modulators, USSR.

In the applied automatic level control of the output power of the transmitter during telephone work on a single sideband with incompleteness of suppressed carrier, the level of high-frequency signal does not remain constant and changes in proportion to the level of the modulating frequency. In the proposed device a memory circuit was applied for memorization of the level of the carrier frequency in the moment of absence of modulation to the moment of appearance of the following pause in modulation. Adjustment of the amplitude of excitation on the intermediate frequency diodes was applied, by connecting the device in series into the divisor circuit, joined to the input of the modulator.

AD-605 645 Div. 8, 15
OTS Prices: HC $3.00/MF $0.75

Mathematics Research Center, Univ. of Wisconsin, Madison.
SLOWLY-VARYING CHANNELS AND SIGNAL DETECTION.
Technical summary rept.,
by W. L. Root. May 64, 54p MRC-TSR-488
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Communication theory, Multipath transmission), (*Multipath transmission, Communication theory), (*Signals, Monitors), Scattering, Radio waves, Noise (Radio), Radio interference, Linear systems, Mathematical models, Statistical processes, Probability, Stochastic processes, Monitors, Distortion, Measurement.

The beginnings of a theory are established concerning time-varying and random linear channels with the intent of characterizing classes of channels which can be determined exactly or approximately by measurement, showing how the measurements can be made, analyzing the errors, and applying the results to the theory of signal detection. The treatment has been limited here to channels which are slowly-varying or which vary slightly around a known trend. Relations between almost-time-invariance of a channel and a certain kind of statistical stationarity are developed. The notion of a determinable channel is defined and developed and classes of examples are given; also the idea of a channel with known trend is made precise and related to determinability. A general example is given to show how the results on channel measurement apply to some of the statistical inference problems of detection theory. (Author)

AD-605 664 Div. 8, 28
OTS Prices: HC $1.00/MF $0.50

Vermont Univ., Burlington.
MESSAGE-CODE MAPPING AND DECODING,
by Bennet B. Murdock, Jr. and Edina C. Oldham.
1 Sep 64, 8p
Contract Nonr3219 02x

Unclassified report

Descriptors: (*Decoding, Tests), (*Communication theory, Coding), (*Coding, Communication theory), Experimental data, Conditioned reflex, Performance (Human), Probability, Reaction (Psychology), Reflexes, Time.

One experiment was conducted to determine the effect of mapping of message symbol on code word (pairing of stimuli and responses). An original message consisting of the first 13 letters of the alphabet was generated by a zero-memory source with a (first-order) redundancy of approximately 14%. In the Normal (or alphabetical) encoding the alphabetical order of the letters corresponded with the numerical order of the code words. In the Reversed code this relationship was switched about, while in the Random code the relationship was determined by chance. A septenary code with digits 1--7 was used throughout. The results showed that the Normal code was decoded most rapidly, the Random code least rapidly, but the differences decreased with practice. Accuracy was consistently high in all three groups. An analysis of the errors that did occur suggested that both stimulus and response confusions were involved; changing the mapping may provide a useful technique for separating these two effects. In general, the results suggest that, in a decoding task, the effects of prior experience become less important with practice. (Author)

AD-605 665 Div. 8, 28
OTS Prices: HC $1.00/MF $0.50

Vermont Univ., Burlington.
SIZE OF CODE ALPHABET AND DECODING,
by Bennet B. Murdock, Jr. and Edina C. Oldham.
1 Aug 64, 8p
Contract Nonr3219 02y

Unclassified report

Descriptors: (*Decoding, Experimental data), (*Coding, Communication theory), Abundance, Conditioned reflex, Reaction (Psychology), Reflexes, Performance (Human), Time.

One experiment was conducted to determine the effect of size of code alphabet on decoding. An original message consisting of the first 13 letters of the alphabet was generated by a zero-memory source with a (first-order) redundancy of approximately 14%. This message was encoded with either a binary, ternary, quaternary, or septenary code. There was a different group of subjects for each code, and their task was to decode back into the original 13 letters as rapidly and as accurately as possible. The results showed that, over the four sessions of testing, performance (i.e., decoding) was most rapid with the septenary code and progressively slower as the size of the code alphabet decreased. Since information load per symbol increases but number of symbols per code word decreases as size of the coding alphabet increases, it would appear that the latter was the critical variable. In general, these results suggest that, as has been noted before, for optimum information processing one wants to maximize the number of bits per chunk; thus, within the limits of the present experiment, the larger the size of the code alphabet the better the performance. (Author)

AD-605 545 Div. 8
OTS Prices: HC $3.00/MF $0.75

Carlyle Barton Lab., Johns Hopkins Univ., Baltimore, Md.
SEA SCATTERING MEASUREMENTS IN THE REGION FROM 9.6 TO 38 kMc,
by C. M. Johnson, S. P. Schlesinger, J. C. Wiltse, and C. W. Smith. Sep 55, 68p RL-JHU-TR-27
Contract NOrd 11299
Unclassified report

Descriptors: (*Microwaves, Scattering), (*Seas, Radiofrequency interference), Microwave frequecny, Radio waves, Propagation, Surface area, Oceans, Doppler effect, Measurement.

The measurements were made primarily to determine the variation of back-scattering cross section of the ocean surface with frequency and grazing angle. Data were obtained for vertically polarized radiation over a frequency range from 9.6 to 38 kMc and for grazing angles from 0 to 80 degrees. In addition, since the test was conducted from the bow of a moving ship with CW, phase-sensitive microwave systems, the doppler frequency characteristics of the returned signals were also measured. In order to determine the effect of height or range on the magnitude of the returned signal, a subsequent test was made overlooking a flowing stream of moderate velocity, and the results are incorporated in this report. From the trends of cross section and doppler frequency with the different parameters. Some insight into the nature of the scattering mechanism can be obtained.

AD-605 558 Div. 8, 17, 25
OTS Prices: HC $6.00/MF $1.25

Research Triangle Inst., Durham, N. C.
INTEGRATED SILICON DEVICE TECHNOLOGY; VOLUME V: PHYSICAL/ELECTRICAL PROPERTIES OF SILICON.
Rept. for May 63-Jan 64,
by R. A. Evans. Jul 64, 240p
Contract AF33 657 10340, Proj. 4159, Task 415905
ASD TDR63 316 V5
Unclassified report

Descriptors: (*Silicon, Electronics), (*Semiconductor devices, Silicon), Mechanical properties, Crystal structure, Atomic properties, Electrical properties, Thermal properties, Conductivity, Density, Photoconductivity, Optical properties, Electromagnetic properties, Piezoelectric effect, Differential equations, Semiconductors, Silicon alloys, Physical properties, Germanium alloys, Integrated circuits.

The various properties of silicon to which numbers can be assigned are discussed in this report. These numbers, as found in the literature, are listed for each effect or property. Some applications of these properties and the theory behind them are given. The properties are grouped under four general headings: mechanical and lattice properties, piezo-properties, electric-thermal-magnetic properties, and photo-properties. A companion volume will cover the chemical/metallurgical properties--none of which are covered in this volume. (Author)

AD-605 563 Div. 8, 30
OTS Prices: HC $1.00/MF $0.50

Hughes Aircraft Co., Oceanside, Calif.
RESEARCH AND DEVELOPMENT OF TWO-COLOR DIRECT VIEW STORAGE TUBE WITH SELECTIVE ERASURE.
Interim development rept. for 1 Apr-1 Jul 64,
by P. P. Damon. Aug 64, 18p
Contract NObsr89452, Proj. SR00 80301, Task 9459
Unclassified report

Descriptors: (*Storage tubes, Colors), (*Display systems, Storage tubes), Fluorescent screens, Brightness, Viewing screens, Electron tube parts, Electron guns, Information retrieval, Resolution, Performance (Engineering), Phosphorescence, Phosphorescence materials.

A direct view storage tube is being developed which is capable of displaying stored information in either of two colors or in intermediate hues, and selectively erasing that information. The viewing screen consists of two phosphors. One occupies small areas in register with the storage-mask holes, while the other occupies areas surrounding the first. The higher count collector mesh has effectively minimized the color moire effect. Additional uniformity improvement was achieved with a longer rear bulb assembly. The red phosphate phosphor is least sensitive to processing techniques and has given the best red light output. Additional effort is required to eliminate green contamination of the red phosphor during red dot-green field printing. The writing and erasing speeds continue to be below the objective requirements. The stored resolution requirement has been achieved. A tube was constructed having a decay of 105 seconds to 50% of equilibrium brightness. Based on earlier calculations this would be adequate to achieve the required one-minute storage time without noticeable color shift. Experimental verification of this must be delayed until a tube with full, uniform color shift is achieved.

AD-605 564 Div. 8, 12, 19
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
COMPONENTS PACKAGING TECHNIQUES.
Semiannual rept. for 1 Jul-31 Dec 59,
by George R. Beck. 31 Dec 59, 50p
STL/TR-59-0000-09958
Contract AF04 647 309
Unclassified report

Descriptors: (*Packaged circuits, Guided missile components), (*Microminiaturization (Electronics), Packaging), Printed circuits, Modules (Electronic), Plastic coatings, Gyroscopes, Welding, Airborne, Design, Reliability (Electronics), Expanded plastics, Protective treatments, Coatings, Materials, Vapor plating, Vacuum apparatus, Quality control, Environmental tests, Vibration, Temperature control, Electric discharges, Aging (Materials), Encapulation.

This report summarizes and evaluates the present status of studies on electronic components packaging techniques described in PROJECT PLAN 165-21. These studies were conducted in four specific areas: (1) design technique studies, (2) materials and processes investigations, (3) microminiaturization and mechanized production studies, and (4) environmental test and vibration studies. For the design technique studies, the test vehicle selected consists of advanced gyro and digital programming circuits which are being packaged using both conventional printed circuit and advanced techniques. In the materials and processes investigations, the limitations of foam encapsulation caused by thermal effects have been analyzed. Investigation was started of capacitance discharge techniques for welding electronic part leads into circuits. The state of the art of microminiaturization has been reviewed in a survey of work in progress at numerous organizations in the electronics industry. Sinusoidal vibration testing, commonly employed in military qualification tests, has been compared in the laboratory with random vibration; equivalence data resulting from these tests are reported. The low-pressure electrical discharge study has been completed. (Author)

circuits, Electric discharges, Signal-to-noise ratio, Electromagnetic waves.

The TPOMI amplifier offers the advantages of 40 to 50% efficiency, a broad bandwidth of about 20% over which amplification is obtained, and a compact configuration when compared to linear beam tubes. The main problem areas upon which the investigations were conducted were those of: establishing the optimum delay line and sole designs, reduction of sparking or breakdowns, improvement of signal-to-noise ratio, and diminishing the radiation of rf energy in an undesired rapid mode. A close interrelationship was found between the breakdown boundary, radiation, and the signal-to-noise characteristics. Better remedies for breakdown in future tubes would make possible better signal-to-noise ratios as well as higher power levels. The required 10 megawatt peak power level was attained in the QK751 with a gain of 14 to 16 db, a typical efficiency of 40% to 50%, and a bandwidth capability of 1220 to 1380 Mc. The full required average power level of 12 kilowatts was obtained successfully, but the specified peak power level could be reached only at pulse durations less than 3 microseconds. Breakdowns limited the output power to about 7 megawatts at the required 10 microseconds pulse duration.

AD-605 731 Div. 8, 30
OTS Prices: HC $1.00/MF $0.50

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
INTEGRATED LOGIC NETS.
Final rept. for 1 Jul 61-30 Jun 64,
by A. K. Rapp and R. S. Silver. 31 Jul 64, 20p
Contract AF19 604 8836, Proj. 4641, Task 464104
AFCRL 64 649

Unclassified report

Descriptors: (*Integrated circuits, Computer logic), (*Computer logic, Integrated circuits), (*Transistors, Computer logic), Semiconductor devices, Gates (Circuits), Field theory, Mathematical models, Digital systems, Manufacturing methods, Design, Electrical properties, Stability, Networks, Theory, Metals, Oxides, Semiconductors, Composite materials.

Investigations into suitable devices for constructing integrated logic nets led to the development of the MOS (metal-oxide-semiconductor) transistor. Success in its fabrication was realized through extensions of the well-established diffusion and photolithographic techniques used for bipolar-transistor construction. Analysis of the MOS structure has produced a mathematical model that is useful for both optimizing device parameters and calculating circuit performance. Digital circuits constructed of MOS transistors can be eminently simple, thus making feasible the fabrication of large-array integrated logic nets. Complete circuits can be constructed of only MOS transistors and evaporated intraconnections. Electrical instabilities which initially were observed in MOS transistors were shown to be not fundamental to the device; alteration of the fabrication process resulted in transistors which exhibited no signs of instability during a 300-hour test period. Recent theoretical and empirical analysis of transistor properties has clarified and confirmed the role played by transistor geometry. In addition, substrate bias voltage was shown to be of value both for increasing pinch-off voltage and for reducing average drain capacitance. (Author)

AD-605 753 Div. 8, 26, 14
OTS Prices: HC $1.00/MF $0.50

Cornell-Dubilier Electric Corp., New Bedford, Mass.
PEM FOR PRODUCTION OF FLUORINATED BARIUM TITANATE CAPACITORS FOR OPERATION TO 200C.
Quarterly rept. no. 13, for period ending 27 Jul 64,
by Paul C. Ricard. 27 Jul 64, 10p
Contract DA36 039SC85955

Unclassified report

Descriptors: (*Capacitors, Manufacturing methods), (*Ceramic capacitors, Fluorination), (*Barium compounds, Titanates), Disks, Ceramic materials, Life expectancy, Performance (Engineering), Dielectrics.

Additional groups of capacitors, items 1-3-2, 1-3-3 and 1-3-4, are now undergoing 1000 hour life tests in accordance with TAR no. 5. Pilot run start has been authorized and manufacturing is proceeding on schedule. No delays in meeting delivery requirements are anticipated. (Author)

AD-605 764 Div. 8
OTS Prices: HC $1.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
INTERACTION BETWEEN SURFACE WAVE TRANSMISSION LINES,
by Alan A. Meyerhoff. 15 May 51, 16p
Projs. 3 99 12 021, 132A
USAEL M1376

Unclassified report

Descriptors: (*Transmission lines, Wave transmission), (*Electromagnetic waves, Propagation), Waveguides, Dielectrics, Electric fields, Surface properties, Electrical conductance, Phase (Electronics), Attenuation, Mathematical analysis.

AD-605 810 Div. 8
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
DOLPH-TCHEBYSCHEFF ARRAYS OF MANY ELEMENTS AND ARBITRARY UNIFORM SPACING,
by Charles J. Drane, Jr. Jun 64, 40p
Proj. 4600
AFCRL 64 344; AFCRL PSRP31

Unclassified report

Prepared in cooperation with Emmanuel Coll., Boston, Mass.

Descriptors: (*Phased arrays, Optimization), (*Antenna configurations, Optimization), (*Antennas, Design), Excitation, Antenna radiation patterns, Numerical analysis, Polynomials, Linear systems, Power series.

The optimum design of Dolph-Tchebyscheff broadside arrays of an odd number of elements presents definite computational problems in terms of existing excitation coefficient design procedures, particularly for element spacings of less than a half-wavelength. This paper presents approximate representations for these coefficients in terms of Bessel functions for arrays of, say, more than twenty elements of arbitrary but uniform spacing. To facilitate comparison of the approximations with exact theory, graphs and tables are presented for various main beam--sidelobe ratios, numbers of array elements, and element spacing. (Author)

AD-605 812 Div. 8
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
MEASUREMENT OF NOISE FIGURE OF AN X-BAND WAVEGUIDE MIXER WITH TUNNEL DIODE,
by Gustav H. Blaeser. Jul 64, 19p

AD-605 666 Div. 8, 28
OTS Prices: HC $1.00/MF $0.50

Vermont Univ., Burlington.
A STUDY OF THREE METHODS OF DECODING,
by Bennet B. Murdock, Jr. and Edina C. Oldham.
1 Apr 64, 10p
Contract Nonr3219 02x
Unclassified report

Descriptors: (*Decoding, Communication theory), (*Communication theory, Decoding), Coding, Experimental data, Tests, Performance (Human), Reaction (Psychology), Reflexes, Sequences, Recovery, Time.

One experiment was conducted to compare three different methods of decoding binary digits. The message consisted of the eight letters A - H encoded in a Huffman-type instantaneous compact code; the redundancy of the message was approximately 8%. The binary digits were either presented sequentially (self-paced) and decoded with telegraph keys or the method of whole presentation was employed with either verbal or written readout. Decoding with the keys was both slower and less accurate than the other two methods; verbal decoding was faster (through no less accurate) than written decoding. It was suggested that decoding time can be subdivided into three components: processing time, reaction time, and recovery time. None of these three components seemed to vary consistently with the length of the code word (or the uncertainty of the symbol transmitted); instead, the relevant factors seemed to be stage of practice and distinctiveness of the stimuli (or responses). Finally, it appears that college students can achieve a rather high rate of decoding in a short period of time with a small message ensemble, whole presentation, and verbal report. (Author)

AD-605 669 Div. 8
OTS Prices: HC $2.00/MF $0.50

Carlyle Barton Lab., Johns Hopkins Univ., Baltimore, Md.
AN APPROACH TO THE DETERMINATION OF THE INTRINSIC DIMENSIONALITY OF A SIGNAL COLLECTION,
by R. S. Bennett. Aug 64, 34p
Contract AF30 602 2597, Proj. 4505, Task 450501
RADC TDR64 212
Unclassified report

Descriptors: (*Signals, Detection), (*Communication theory, Signals), Programming (Computers), Factor analysis, Mathematical models, Signal generators.

The intrinsic dimensionality of a collection of signals is defined in terms of the minimum number of free parameters required in a hypothetical signal generator capable of producing a close approximation to each signal in the collection. A suggested computer program outline for estimating this dimensionality from the signal coordinates on an arbitrary orthogonal basis is developed. The program is based on some results from a related multidimensional scaling problem, and utlizes an inverse relationship between the variance in interpoint distances within a hypersphere, and the dimensionality of the hypersphere. The method is independent of the choice of orthogonal basis, and no prior knowledge of the analytical form of the signals is assumed. Data points themselves are used, with no attempt to infer a continuous approximating function. (Author)

AD-605 674 Div. 8
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
COMPLEXITY AND RELIABILITY IN ELECTRONIC EQUIPMENT,
by R. R. Carhart. 30 Apr 53, 4p P-399
Unclassified report

Paper prepared for presentation at the 1953 Electronics Components Symposium, Pasadena, Calif.

Descriptors: (*Reliability (Electronics), Control), Electronics equipment, Electron tubes, Life expectancy, Analysis.

Complexity as the source of unreliability in electronic equipment is discussed. The relationship between complexity and simplification is established and the need for radical advances in electronic reliability to reduce failures is stressed.

AD-605 680 Div. 8, 15
OTS Prices: HC $2.00/MF $0.50

Carlyle Barton Lab., Johns Hopkins Univ., Baltimore, Md.
MULTIPATH TRANSMISSION FROM AN INACCESSIBLE SOURCE,
by F. C. Ogg, Jr. and P. J. Butterly. Aug 64, 42p
Contract AF30 602 2597, Proj. 4505, Task 450501
RADC TDR64 284
Unclassified report

Descriptors: (*Communication theory, Multipath transmission), (*Multipath transmission, Communication theory), Ionospheric propagation, Mathematical models, Radiofrequency filters, Correlators, Attenuation, Integral transforms, Distortion, Radio interference, Monitors, Intelligibility, Scattering.

The problem of obtaining reliable reception from an inaccessible transmitter under multipath propagation conditions is considered in terms of the following two problems: The derivation of a filter for the elimination or reduction of multipath effects; and, the estimation of the multipath channel parameters necessary for the implementation of this filter from a knowledge of the received signal alone. This report assumes that the more important phenomena associated with ionospheric propagation may be described in terms of a simple model of the transmission medium. This model serves as a starting point for the derivation of a filter, the purpose of which is the elimination of waveform distortion introduced by the medium. The autocorrelation function of the received signal is used to estimate the filter parameters corresponding to the prevailing channel structure. The operation of the filter in both time and frequency domains is described and some limiting features of the method of filter parameter estimation are discussed. (Author)

AD-605 715 Div. 8
OTS Prices: HC $7.00/MF $1.75

Raytheon Co., Burlington, Mass.
DEVELOPMENT OF TPOMI-TYPE 10 MW L-BAND FORWARD-WAVE AMPLIFIER.
Final rept.,
by Robert E. Edwards. 17 Aug 64, 358p PT-470
Contract AF30 602 1830, Proj. 4560, Task 45742
RADC TDR62 383
Unclassified report

Rept. on QK751.

Descriptors: (*Microwave amplifiers, Traveling-wave tubes), (*Traveling-wave tubes, Microwave amplifiers), L band, Magnetrons, Crossed field devices, Radiofrequency power, Gain, Broadband, Radiofrequency pulses, Design, Performance (Engineering), Delay

Descriptors: (*Rocket motors, Exhaust gases), (*Exhaust gases, Temperature), (*Wave transmission, Exhaust gases), (*Radar signals, Attenuation), Radar tracking, Radiofrequency waves, Communication systems, Solid rocket propellants, Combustion chambers, Nozzle gas flow, One-dimensional flow, Gas ionization, Plasma physics, Thermodynamics, Kinetic theory, Correlation techniques, Pressure.

The dependence of radar attenuation on exhaust gas temperature has been previously used both as a semi-empirical correlative technique and as a means of identifying the dominant electron source. A method is presented of relating this observed temperature dependence to fundamental propulsion system characteristics in both the equilibrium and nonequilibrium flow regimes. Implications of the theory are discussed and illustrative calculations are given for a class of conical expansion section, one-dimensional nozzle flows. Results are compared with attenuation measurements recently reported on aluminized solid propellant motors. (Author)

AD-605 856 Div. 8, 25, 30
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
A NEW METHOD TO SIMPLIFY BRIDGE TYPE MEASUREMENTS ON QUARTZ CRYSTAL UNITS,
by E. Hafner. 8 Nov 57, 26p
Proj. 3 99 00 100, Task 3 99 12 101
USAEL E1220; PB 163 812

Unclassified report

Descriptors: (*Quartz, Crystal oscillators), (*Crystal oscillators, Test methods), (*Impedance bridges, Measuring devices, (Electrical and Electronic)), Very high frequency, Electric bridges, Design, Electrical properties, Test equipment.

After a discussion of the two major elements of the equipment dealt with in this report, two different methods to control the signal frequency by utilizing the information contained in the output signal of the bridge are described. Although this is not a limitation, the methods are explained using one particular type bridge, the Hewlett-Packard Model 803A VHF Impedance Bridge. The same principles can be employed for many other test circuits.

AD-605 883 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ABSORPTION OF RADIO WAVES BY AIR BEHIND A SHOCK WAVE,
by T. V. Bazhenova and Yu. S. Lobastov.
23 Dec 63, 20p
FTD MT63 74; TT 64 71407

Unclassified report

Edited machine trans. of mono. Fizicheskaya Gazodinamika, Teploobmen i Termodinamika Gazov Vysokikh Temperatur (Physical Gas Dynamics, Heat Exchange and Thermodynamics of Gases of High Temperatures) Moscow, 1962, p. 120-130.

Descriptors: (*Blackout (Electromagnetic), Shock waves), (*Radio waves, Absorption), (*Absorption, Radio waves), Microwave frequency, Shock tubes, Gas ionization, Electron density, Oscillographs, Temperature, Pressure, Wave transmission, Thermodynamics, USSR.

Results are given of experiments on the absorption of radio waves (10,000 mc) in a shock tube by air at temperatures from 2000 to 4000K. The time of establishment of equilibrium concentration of electrons is determined. Measured and calculated data on absorption of radio waves are compared. It is shown that in the zone of unequilibrium dissociation, possessing increased temperature and concentration of NO, no increased concentration of free electrons appear since the time of achievement of equilibrium concentration of electrons is commensurable with the time of achievement of equilibrium temperature and composition. (Author)

AD-605 905 Div. 8
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TRANSMISSION OF INFORMATION BY ORTHOGONAL SIGNALS,
by I. M. Teplyakov. 9 Mar 64, 12p
FTD MT63 233; TT 64 71425

Unclassified report

Edited machine trans. of Radiotekhnika (USSR) 1963, v. 18, no. 4, p. 3-7.

Descriptors: (*Communication theory, Wave transmission), (*Wave transmission, Communication theory), Radio signals, Pulse modulation, Phase modulation, Radiofrequency power, Phase distortion, Signal-to-noise ratio, USSR.

The effect of delays during transmission and reception of information on the required minimum possible signal power is evaluated. (Author)

AD-605 923 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

Army Electronics Labs., Fort Monmouth, N. J.
ADVANCES IN SOLID-STATE MICROWAVE DEVICES,
by Wesley G. Matthei. Jul 64, 94p
Task 1P6 22001A056 04 21
USAEL TR2476

Unclassified report

Descriptors: (*Microwave equipment, Solid state physics), (*Solid state physics, Microwave equipment), Amplifiers, Parametric amplifiers, Tunnel diodes, Transistors, Microwave oscillators, Diodes (Semiconductor), Varactor diodes, Phonons, Traveling-wave tubes, Harmonic oscillators, Superconductors, Reviews, Theory.

The most recent and promising improved and/or new microwave solid-state devices are reviewed in this report, which is divided into two parts: Part I: Improved Junction Devices; and Part II: New Bulk-Effect Devices. Part I consists of a review of the state-of-the-art of microwave solid-state amplifiers, generators, and switches. Part II consists of a summary of the state-of-the-art of the recent, new microwave bulk-effect devices, phonon devices, hot-carrier thermoelectric devices, superconducting parametric amplifier, and the Gunn effect generator. (Author)

AD-605 941 Div. 8, 12
OTS Prices: HC $3.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
COMPONENTS PACKAGING TECHNIQUES.
Final rept. for 1 Jul 60-30 Jun 61,

Proj. 4600
AFCRL 64 547; AFCRL PSRP32

Unclassified report

Descriptors: (*Mixers (Electronic), X band), (*Signal-to-noise ratio, Mixers (Electronic)), (*Tunnel diodes, Mixers (Electronic)), Waveguides, Measurement, Attenuation, Pumping (Electronics), Intermediate frequency, Circuits, Test methods.

Noise-figure measurements of an X-band tunnel diode mixer must be carried out with extreme care, since spurious responses can often produce incorrect results. At microwave frequencies, a waveguide system with a plunger at one side of the diode is used and it is important that one terminal of the diode be isolated from the waveguide wall when the bias voltage is applied. The output of the mixer containing the difference frequency is connected to the input of an amplifier with a series combination of bias components. This series combination contains additional inductance and capacitance other than that of the 30 Mcps amplifier and can produce resonance effects when the tunnel diode is operated in the positive region close to the peak current, thereby leading to an error in the noise-figure measurement. Correct and incorrect noise figures are compared. A noise figure of 3 db, free of spurious responses, has been measured for a tunnel diode (D4168D) operated at a pump frequency of 9.205 Gc and a difference frequency of 30 Mcps in an X-band waveguide mixer. (Author)

AD-605 813 Div. 8, 2
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
APPARENT SKY TEMPERATURES AT MILLIMETER-WAVE FREQUENCIES,
by Karl N. Wulfsberg. Jul 64, 37p
Proj. 4600
AFCRL 64 590; AFCRL PSRP38

Unclassified report

Descriptors: (*Atmospheric temperature, Microwave frequency), (*Radiofrequency interference, Troposphere), Millimeter waves, K band, Atmospherics, Water vapor, Oxygen, Absorption, Radiometers, Radio reception, Attenuation, Antennas, Intensity, Meteorological parameters.

Measurements of apparent sky temperatures taken over a one-year period at 15, 17 and 35 Gc are summarized. Sky temperature profiles for various meteorological conditions are presented as well as curves showing the percentage time distributions for various zenith angles. Such factors as absorption and radiation by oxygen and water vapor, extrapolation of the data to other geographical areas, and the relation between total attenuation of the atmosphere and sky temperature are discussed. A description of the radiometers and the calibration techniques are included. (Author)

AD-605 834 Div. 8
OTS Prices: HC $1.00/MF $0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR SUB-MINIATURE TEMPERATURE-COMPENSATING CERAMIC CAPACITORS.
Quarterly rept. no. 11, 13 Dec 63-12 Mar 64,
by J. H. D. Folster. 12 Mar 64, 10p
Contract DA36 039SC85966

Unclassified report

Descriptors: (*Ceramic capacitors, Manufacturing methods), (*Subminiature electronic equipment, Ceramic capacitors), Temperature, Ceramic materials, Performance (Engineering), Tests, Life expectancy.

Development effort during this period has led to preliminary success in manufacturing Case Size III units of Formulations NP0 and N1400. Pilot run quantities of these parts are now being manufactured. Case Size II units of Formulation NP0 will complete testing March 16, 1964. (Author)

AD-605 835 Div. 8
OTS Prices: HC $1.00/MF $0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR SUB-MINIATURE TEMPERATURE-COMPENSATING CERAMIC CAPACITORS.
Quarterly rept. no. 10, 13 Sep-12 Dec 63,
by J. H. D. Folster. 12 Dec 63, 12p
Contract DA36 039sc85966

Unclassified report

Descriptors: (*Ceramic capacitors, Manufacturing methods), (*Subminiature electronic equipment, Ceramic capacitors), Temperature, Ceramic materials, Dielectrics, Dielectric properties, Electric discharges, Failure (Mechanics), Performance (Engineering), Life expectancy, Thickness.

Analysis of failures on life test of three contract items revealed their failure was due to dielectric breakdown. An investigation into the causes of this breakdown and the work being done to prevent recurrences of it are reported herein. (Author)

AD-605 842 Div. 8, 26
OTS Prices: HC $1.00/MF $0.50

Westinghouse Electric Corp., Youngwood, Pa.
PRODUCTION ENGINEERING MEASURE. TYPE 2N1814 SILICON ALLOY TRANSISTOR.
Quarterly progress rept. no. 4, 1 Apr-30 Jun 64,
by M. F. Amsterdam, D. L. Moore, R. J. Pisarcik, and W. E. Shopsky. 30 Jun 64, 20p
Contract DA36 039AMC03617E, Proj. 21059PP 63 81 81

Unclassified report

See also AD-601 676.

Descriptors: (*Transistors, Manufacturing methods), Reliability (Electronics), Silicon alloys, Processing, Encapsulation, Soldering, Diffusion, Material removal, Microstructure, Material forming.

The status of all phases of the reliability improvement program is presented. Progress made and difficulties encountered causing a delay in the performance of each task is described. The installation of pulse peak power test equipment and data recorded from the initial probe are reported. (Author)

AD-605 849 Div. 8, 9, 25, 27
OTS Prices: HC $1.00/MF $0.50

AeroChem Research Labs., Inc., Princeton, N. J.
CORRELATION OF RADAR ATTENUATION WITH ROCKET EXHAUST TEMPERATURE,
by Daniel E. Rosner. May 64, 15p Aerochem-TP-89
Contract AF30 602 3142

Unclassified report

Problem areas that exist in microelectronics, the art of making electronic circuit functions directly from raw materials using physical and chemical processing techniques, are listed. Areas under discussion are process technology and materials, device characteristics, circuit techniques, and interconnection and packaging.

AD-606 080 Div. 8, 2, 30
OTS Prices: HC $1.00/MF $0.50

Physical Science Lab., New Mexico State Univ., University Park.
DESIGN OF MODEL 2.040 AND 2.041 QUADRALOOP ANTENNAS,
Scientific rept. no. 1.
Sep 63, 25p
Contract AF19 628 3229, Proj. 7043, Task 765901
Unclassified report

Legibility of this document is in part unsatisfactory; reproduction has been made from best available copy.

Descriptors: (*Loop antennas, Rocket antennas), (*Telemetering antennas, Sounding rockets), Design, Antenna configurations, Very high frequency, Bandwidth, Electrical impedance, Antenna radiation patterns, Performance (Engineering), Installation.

The Models 2.040 and 2.041 Quadraloop Antennas are the result of a mounting problem associated with the Aerobee rocket telemetry extension. The Model 2.041 is the pressurized version of the un-pressurized Model 2.040. Electrical and mechanical characteristics are given in the form of graphs and figures. (Author)

AD-606 087 Div. 8, 6
OTS Prices: HC $3.00/MF $0.75

Alford (Andrew) Consulting Engineers, Boston, Mass.
EXPERIMENTAL STUDY OF THE BACK SCATTERING FROM CONDUCTING OBJECTS IN THE RANGE OF ONE QUARTER TO ONE WAVELENGTH IN SIZE.
Final rept.,
by David P. Flood and John C. Field. Apr 64, 66p
Contract AF19 628 2456, Proj. 4600, Task 460004
AFCRL 64 541
Unclassified report

Descriptors: (*Radar echo areas, Geometric forms), (*Radar reflections, Reduction), (*Electromagnetic wave reflections, Reduction), Radar reflectors, Intensity, Inductance, Capacitance, Attenuation, Measurement, Horn antennas, Detection, Phase measurement, Band width, Experimental data.

The primary purpose of this study was to reduce the magnitude of the back scattering from objects by introducing reactive or other loading. Analytic solutions for values of loading have previously been obtained for certain simple objects. However, the complexity of an analytic approach for larger and more complicated objects led to the experimental approach of this study. A system was developed to measure the relative phase and magnitude of the back-scattered fields. This phase and magnitude information was extremely valuable in the reduction of back scattering by means of reactive loading. A number of objects were detuned by means of reactive loading. The detuned objects included regular polyhedrons, dipole and monopole elements, cylinders, and planar structures. The objects' back-scattering cross sections were reduced 15-db to 20-db or more at the frequency of minimum back scattering. Some bandwidths obtained were in order of 15-percent to 30-percent for reductions of 15-db in cross section. (Author)

AD-606 088 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Microwave Associates, Inc., Burlington, Mass.
SOLID-STATE GENERATOR.
Quarterly progress rept. no. 5, 1 Jun-31 Aug 64,
by Ernst F. Scherer. 31 Aug 64, 25p
Contract NObsr89356, Proj. SR008 03 31, Task 9391
Unclassified report

Descriptors: (*Radiofrequency generators, Semiconductor devices), (*Semiconductor devices, Radiofrequency generators), (*Frequency multipliers, S band), (*Radiofrequency filters, Broadband), Power amplifiers, Diodes semiconductor), Transistors, Varactor diodes, Design, Circuits, Transistor amplifiers.

Subjects of investigation during this period were: (A) The development of a final S-Band tripler (B) The development of 1 Gc and 3 Gc multisection broadband filters. (C) A program of development and variations in design concepts concerning the power amplifier and multipliers. These areas involving the development of the Solid-State RF Generator have been carefully evaluated and a summary of that work, to date, is included in this report.

AD-606 092 Div. 8, 25
OTS Prices: HC $3.00/MF $0.50

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
AN EXTENSION OF THE MODIFIED GEOMETRICAL OPTICS METHODS FOR RADAR CROSS SECTIONS OF DIELECTRIC BODIES.
Scientific rept. no. 25,
by T. Kawano and L. Peters, Jr. 15 Jan 64, 53p
OSURF-1116-38
Contract AF19 604 7270, Proj. 5633, Task 563306
AFCRL 64 714
Unclassified report

Descriptors: (*Radar echo areas, Dielectrics), (*Dielectrics, Radar echo areas), (*Optics, Radar echo areas), Spheres, Dielectric properties, Plasma physics, Light, Radar reflections, Refractive index, Scattering, Numerical analysis, Graphics.

The radar cross section of a dielectric sphere whose relative dielectric constant is significantly greater than unity is computed by means of the modified geometrical optics method. A new technique is introduced for treating the on-axis, internally reflected ray for the regions where the geometrical optics approach fails. Numerical calculations are made for the sphere whose specific dielectric constant is equal to 2.592 (i.e., refractive index is equal to 1.61). The results compare favorably with those obtained from the boundary value solution. The contributions of the stationary rays are relatively large and the rapid oscillations in the region of larger radius are attributed to the multiple bounce stationary ray. (Author)

AD-606 093 Div. 8, 25, 30
OTS Prices: HC $2.00/MF $0.50

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
A COMPUTER PROGRAM FOR RADAR CROSS SECTIONS OF DIELECTRIC BODIES USING THE MODIFIED GEOMETRICAL OPTICS METHOD.
Scientific rept. no. 26,
by Li-Jen Du. 15 Jan 64, 48p OSURF-1116-42
Contract AF19 604 7270, Proj. 5633, Task 563306
AFCRL 64 715
Unclassified report

by George R. Beck. 30 Jun 61, 52p
STL-7204-0001-RU-000
Contract AF04 64" 619, Proj. 165 21
BSD TR61 7 Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Packaging, Electronic equipment), (*Modules (Electronic), Design), (*Microminiaturization (Electronics), Design), (*Packaged circuits, Design), Guided missile components, Reliability (Electronics), Thermal properties, Gyroscopes, Timing circuits, Materials, Manufacturing methods, Welding, Resistance welding, Microstructure, Relaxation oscillators, Vibration, Environmental tests, Circuit interconnections, Encapsulation.

In evaluating new design techniques for packaging electronic and electromechanical components, efforts were concentrated on cordwood arrangement of electronic parts into modules, resistance welding of electrical connections, and techniques for implementing these approaches. Advanced gyro control circuits were used as a test vehicle for integration of study efforts in four specific areas: design techniques, materials and processes, microminiaturization, and thermal and vibration studies. The design study resulted in three operational prototype assemblies containing 2548 electronic parts and three gyroscopes occupying 0.6 cubic foot and weighing 34 pounds. Basic types of metallurgical joints were defined by examination of microstructure of the welded electrical connections. Other investigations included welding process control, economic studies, connection techniques, and encapsulation studies. Microminaturization studies on the micromodule technique led to development of a hybrid design approach and sample experimental solid state circuits were evaluated. Theoretical vibration and shock studies were made on problems related to environmental testing of missile electronic equipment. (Author)

AD-605 948 Div. 8, 5
OTS Prices: HC $3.00/MF $0.75

General Electric Co., Syracuse, N. Y.
RESEARCH ON DEVICES FOR THE DETECTION OF WEAK SIGNALS.
Final rept. for Jul 63-Jun 64.
by N. R. Powell and R. W. French. Sep 64, 100p
Contract AF33 657 11369, Proj. 4335, Task 433508
AL TDR64 224
Unclassified report

Descriptors: (*Demodulators, Radio signals), (*Radio signals, Monitors), (*Communication theory, Demodulation), Demodulation, Modulation, Oscillators, Bandwidth, Communication systems, Communication equipment, Signal-to-noise ratio, Adaptive communication systems, Correlators, Circuits, Wiring diagrams, Control systems, Automatic, Theory.

Reported are the principal results of a study of weak-signal communication techniques. These results include an evaluation of the communications potential associated with a typical time-varying channel, determination of efficient weak-signal detector configurations consistent with such channels, derivation of the threshold preformance for one such configuration for phase-feedback controlled parameter demodulation, and an introduction to the design details of an automatic bandwidth-controlled demodulator. The report contains a detailed description of an implementation of these ideas along with a summarization of technical results.

AD-606 007 Div. 8, 26
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge Inc., Los Angeles, Calif.
STRIP TRANSMISSION LINES,
by G. L. Matthaei, C. F. Eaton, and H. M. Wachowski.
15 Jan 58, 10p
Unclassified report

Descriptors: (*Microwave equipment, Design), Manufacturing methods, Band-pass filters, Resonators, Broadband, Mixers (Electronic), High-pass filters, Printed circuits, Microwave frequency, Airborne, Crystal holders, Coupling circuits.

Microwave components using strip transmission line construction is reported. The research and development work is centered about the design of microwave components exhibiting the following characteristics: Small size and weight; ease of fabrication, and unusually wide useful frequency range. Components with such characteristics will aid materially in the design of advanced airborne electronic systems.

AD-606 035 Div. 8, 14, 17, 26
OTS Prices: HC $2.00/MF $0.50

International Resistance Co., Philadelphia, Pa.
PRECISION VOLUME RESISTOR.
Interim development rept. no. 3, 1 Dec 63-29 Feb 64,
by M. Burk, C. Huang, and K. M. Merz. 20 Mar 64,
50p
Contract NObsr89439, Proj. SR008030, Task 9598
Unclassified report

Descriptors: (*Ceramic materials, Resistors), (*Resistors, Manufacturing methods), (*Materials, Resistors), Carbon resistors, Nickel, Powder metals, Electrical properties, Aluminum compounds, Oxides, Chromium compounds, Vanadium compounds, Palladium, Silver, Glass, Composite materials, Carbon, Manufacturing methods, Resistance (Electrical), Particles, Decomposition, Glass resistors.

During the last period work was continued on the preparation of finely divided nickel powders for use in ceramic resistor systems. A study of the thermal decomposition of nickel formate in an autoclave at temperatures between 200C and 300C was carried out. To date, the smallest average particle size attained is 0.4 microns. Preparation methods and some electrical properties of alumina-chromia-ceramic and vanadia-ceramic bodies have been investigated. In general, these systems have exhibited high voltage and temperature coefficients. Two ceramic-conductor resistor systems have been prepared and partially evaluated. The first consists of Pd or Pd/Ag powders dispersed in an alumina-glass matrix. With this system, T. C.'s below 200 ppm/C have been obtained in the range 2-10K omega. The second system, based on a mixture of palladium and carbon dispersed in an alumina-glass matrix has shown high negative T. C.'s and relatively low resistance ranges. (Author)

AD-606 064 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Office of Naval Research, Washington, D. C.
MICROELECTRONIC PROBLEM AREAS AND RESEARCH NEEDS.
Aug 64, 18p
Unclassified report

Rept. issued by the Navy Panel on Microelectronics.

Descriptors: (*Microminiaturization (Electronics), Reviews), (*Molecular electronics, Reviews), Processing, Materials, Manufacturing methods, Crystals, Semiconductors, Thin films (Storage devices), Transistors, Diodes (Semiconductor), Physical properties, Integrated circuits, Packaged circuits, Circuit interconnections, Reliability (Electronics), Design.

AD-606 137 Div. 8
OTS Prices: HC $3.00/MF $0.75

Microwave Associates, Inc., Burlington, Mass.
STUDY OF PLASMA AMPLIFIERS.
Scientific rept. no. 1,
by J. Coccoli. 29 Feb 64, 92p
Contract AF19 628 452, Proj. 4645, Task 464502
AFCRL 64 445

Unclassified report

Descriptors: (*Microwave amplifiers, Plasma physics), (*Plasma medium, Cyclotron resonance phenomena), Electrons, Cyclotron waves, Electric fields, Oscillation, Relativity theory, Waveguides, Absorption, Electron beams.

A combined theoretical and experimental program to investigate several fast wave interaction mechanisms between microwave radiation and a plasma or electron gas in a uniform magnetic field is described. An 'average electron' model is presented; this model is applicable to the situation of electrons in a rectangular waveguide. The model predicts the predominance of the relativistically dependent mechanism as the phase velocity of the wave approaches infinity, e.g., the situation at waveguide cutoff. Measurements of the absorption of microwave power by electrons in a rectangular waveguide are presented. These data show the relativistic shift of the absorption curve with increasing 'transverse' electron energy. Both from technical and economic considerations, an amplifier device, based on these fast wave mechanisms does not appear to be feasible at this time. To realize a practical amplifier a reliable and economical method of producing a highly anisotropic electron beam must be developed.

AD-606 145 Div. 8, 25, 26
OTS Prices: HC $3.00/MF $0.50

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURE: MECHANIZATION OF SEMICONDUCTOR DEVICES, 2N560, 2N1051, 2N1072, 2N1195, 1N664, 1N665, 1N666, 1N667, 1N668, 1N669, 1N673, 1N675, 1N697 AND 1N701.
Quarterly progress rept. no. 19, 1 Apr-30 Jun 64,
by M. N. Reppert. 30 Jun 64, 52p
Contract DA36 039sc81294 Unclassified report
See also AD-602 006.

Descriptors: (*Semiconductor devices, Production), (*Transistors, Production), (*Diodes (Semiconductor), Production)), Industrial production, Machines, Manufacturing methods, Test equipment (Electronics), Test methods, Welding, Material removal, Soldering, Guided missile components.

The purpose of this Production Engineering Measure is to design and develop production techniques with the objectives of establishing production capacities that are compatible with semiconductor requirements for Nike anti-missile systems. Production capability is to be established for the following three areas - two transistor and one diode - in support of Nike Zeus. During this report period, refinement of one additional mechanized operation was completed, increasing the total completed to ten. The two machines contracted for development were completed. The diode Data Producing Test Set was completed and refinements are in progress, pending, or anticipated on ten other mechanized operations. Tooling refinements were begun on two diode operations - tubulation lead welding and process testing. Work continues on other tooling refinements, process refinements and engineering studies.

See also AD-606 092.

Descriptors: (*Programming (Computers), Radar echo areas), (*Radar echo areas, Dielectrics), (*Dielectrics, Radar echo areas), (*Optics, Radar echo areas), Plasma physics, Cylindrical bodies, Electromagnetic waves, Scattering, Numerical analysis.

A computer program has been written using the modified geometrical optics method for evaluating the electromagnetic scattering from a cylinder made of plasma or dielectric material. It can be applied in general to two dimensional dielectric bodies of arbitrary shape and permittivity after minor modifications. A description and details of the program are included. (Author)

AD-606 094 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
GEOMETRICAL OPTICS FOR GYROTROPIC BODIES.
Scientific rept. no. 27,
by W. C. Y. Lee, L. Peters, Jr., and C. H. Walter.
15 Apr 64, 42p OSURF-1116-45
Contract AF19 604 7270, Proj. 5633, Task 563306
AFCRL 64 716 Unclassified report

See also AD-606 093.

Descriptors: (*Optics, Electromagnetic wave reflections), (*Electromagnetic wave reflections, Optics), Solids, Geometric forms, Electromagnetic waves, Scattering, Radar echo areas, Geometry, Numerical methods and procedures.

The methods of geometrical optics are extended so that they may be applied to gyrotropic bodies. Various internal and external reflections are considered at non parallel planar interfaces and means of determining the ray path or directions of energy flow are derived. Non-planar geometrics may be represented by the tangent planes at the various points of incidence. A method is given for computing the phases of the various fields. These values may be used to determine the reflected fields from such a gyrotropic body. (Author)

AD-606 098 Div. 8, 5, 12
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PROPAGATION CONSIDERATIONS IN SPACE OPERATIONS,
by Cullen M. Crain. 6 Mar 58, 21p P-1305
Unclassified report

A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Space communication systems, Radio transmission), (*Radio transmission, Space communication systems), Spacecraft, Earth, Radio waves, Propagation, Attenuation, Atmospherics, Angle of arrival, Doppler effect, Polarization, Refraction, Solar radiation, Electron density, Ionosphere.

The propagation factors which are pertinent in radio links between the earth and space vehicles, and also radio links between vehicles operating well beyond the earth's atmosphere are considered.

AD-606 122 Div. 8, 13, 30
OTS Prices: HC $3.00/MF $0.75

General Dynamics/Fort Worth, Tex.
RADAR CROSS SECTION TARGET SUPPORTS: METAL COLUMNS AND SUSPENSION DEVICES.
Final rept.,
by C. C. Freeny and R. A. Ross. Jun 64, 86p
FZE-222-5
Contract AF30 602 2831, Proj. 6503
RADC TDR64 382
Unclassified report

RAT SCAT Research and Development Program rept. no. 5. Subcontract to Cornell Aeronautical Lab., Inc., Buffalo, N. Y.

Descriptors: (*Radar targets, Supports), (*Radar echo areas, Measurement), (*Supports, Radar targets), (*Suspension devices, Radar targets), Metals, Foundations (Structures), Electromagnetic shielding, Cordage, Plastics, Electromagnetic wave reflections, Errors, Test methods, Models (Simulations).

The shielded metal column program was devoted specifically to the investigation of errors in cross section measurement resulting from the use of a large, hydraulically actuated metal target support at the RAT SCAT Site. The analytical model used and the factors taken into consideration in arriving at a test program for use in evaluating shielding techniques for the metal target support are described in this report. The suspension target support program was an experimental program carried out by Cornell Aeronautical Laboratory. A scale ground plane range was used to simulate low-frequency operation on the RAT SCAT range. Most of the measurements made were for the purpose of determining the cross section return of such conventional suspension target supports as nylon. The parameters of primary concern were size and the polarization of the transmitter and receiver. (Author)

AD-606 125 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM.
Quarterly progress rept. no. 6, 16 Mar-15 Jun 59,
by P. Kusch. 15 Jun 59, 42p
CU-6-59-SC-73279 Physics
Contract DA36 039SC73279, Task 3 99 06 108
PB 160 454; AD 225 123
Unclassified report

See also PB-159 921.

Descriptors: (*Masers, Materials), (*Magnetrons, Frequency), (*Microwave spectroscopy, Scientific research), Radio astronomy, Microwaves, Electromagnetic waves, Cerenkov radiation, Microwave equipment, Infrared radiation, Standing wave ratios, Crogenics, Hyperfine structure, Ionization, Atomic structure, Free radicals, Chemical bonds, Hydrogen, Helium, Ruby.

Work on several maser projects is reported. These include solid state masers at 3 cm and at 21 cm, a solid state maser to operate at liquid nitrogen temperatures instead of liquid helium temperatures and an infrared maser. The application of maser techniques to radio-astronomic measurements and to high resolution spectroscopy of molecules is discussed. Studies of various materials, directed towards an elucidation of the properties of these materials for potential maser application are described. Continuing work on magnetron development and on the generation of Cerenkov radiation is reported. Experiments directed towards determining hyperfine structure measurements in various atoms are described. Finally the results of a continuing interest in the properties of the metastable state of hydrogen are described and a new experiment is proposed to determine the lifetime of the metastable state of singly ionized helium, a hydrogenic atom. (Author)

FDL TDR64 7

Unclassified report

Prepared in cooperation with Aeronautical Research Associates of Princeton, Inc., N. J.

Descriptors: (*Conical bodies, Supersonic flow), (*Supersonic flow, Numerical analysis), (*Numerical methods and procedures, Integrals), Hypersonic flow, Boundary value problems, Differential geometry, Gas flow, Dynamics, Fluid mechanics.

The supersonic flow over cones of arbitrary shape was investigated by using the method of integral relations. The equations are derived for one strip using a body-oriented coordinate system. Various choices for basic equations are discussed. The solution of the boundary value problem for a number of fundamentally different cases is discussed in detail and various suggestions concerning improvements of the method and other related methods are made. Due to severe computational difficulties, however, no numerical results are presented. (Author)

AD-605 289 Div. 9, 30
OTS Prices: HC $6.00/MF $1.25

Harry Diamond Labs., Washington, D. C.
PROCEEDINGS OF THE FLUID AMPLIFICATION SYMPOSIUM, VOLUME IV. SPONSORED BY THE HARRY DIAMOND LABORATORIES, MAY 19, 64.
May 64, 254p

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy, see also AD-601 501.

Descriptors: (*Amplifiers, Symposia), (*Hydraulic systems, Symposia), (*Fluid mechanics, Amplifiers), Liquid jets, Fluid flow, Secondary injection, Control systems, Computer logic, Coding, Thrust vector control systems, Bleed systems, Conical nozzles, Schlieren photography, Medical equipment, Values, Machine tools, Pneumatic systems.

Contents: Attachment of a jet to a curved wall, separated flow in curved channels with secondary injection, application of pure logic to on-off control systems, a fluid encoding system, thrust vector control using a bleed off-reinjection device, supersonic fluid amplification with various expansion ratio nozzles, high-speed schlieren cinematography, four fluid amplifier controlled medical devices, fluid units of the ball valve type and their application to the control of a machine tool.

AD-605 295 Div. 9, 31
OTS Prices: HC $2.00/MF $0.50

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
FORCES ON A SUBMERGED BODY WITH AND WITHOUT FINS UNDER A TRAIN OF REGULAR WAVES,
by Young Chey and Daniel Savitsky. Aug 64, 40p
SIT-DL-1006
Contract Now62 0357C FBM, Proj. 2777/346, Task 6

Unclassified report

Descriptors: (*Underwater objects, Force (Mechanics)), Cylindrical bodies, Oscillation, Water waves, Seas, Mathematical analysis.

Under a regular beam sea, the forces and moments acting on a circular cylinder with and without a pair of fins were measured experimentally. The test cylinder had a length-to-diameter ratio of 6.17. Five configurations were tested, one without fins and four with variations in fin size and fin location. The presence of a pair of fins reduced suction forces considerably. The largest reduction was effected by fins one-half the cylinder radius in height, positioned at an angle of 60 degrees from the horizontal plane passing through the cylinder axis. Conformal transformation and the Blasius theorem were used in a theoretical analysis, the results of which agree fairly well with experimental findings. (Author)

AD-605 315 Div. 9, 15, 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
A DIFFERENCE APPROXIMATION FOR THE MOMENTUM EQUATION OF A TWO-DIMENSIONAL, CYLINDRICALLY SYMMETRIC, SHOCK HYDRODYNAMICS PROGRAM,
by Richard Grote and Sherman Gratch. Sep 64, 20p RM-4233-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Momentum, Equations), (*Programming (Computers), Hydrodynamics), (*Two-dimensional flow, Numerical analysis), Fluid mechanics, Shock (Mechanics), Difference equations, Partial differential equations, Motion, Acceleration, Hydrostatics, Vector analysis.

A finite difference approximation for the momentum equation of a two-dimensional Lagrangian shock hydrodynamics computer program with cylindrical symmetry is developed from Euler's equation for an inviscid fluid. (Author)

AD-605 321 Div. 9, 4, 25
OTS Prices: HC $3.00/MF $0.75

Polytechnic Inst. of Brooklyn, N. Y.
LAMINAR BOUNDARY LAYERS WITH CHEMICAL REACTIONS,
by Herbert Fox. Jun 64, 72p PIBAL-835
Grant AF AFOSR62 409
AFOSR 64 1394

Unclassified report

Descriptors: (*Laminar boundary layer, Chemical reactions), (*Chemical reactions, Laminar boundary layer), Transport properties, Pyrolysis, Methane, Dissociation, Oxygen, Catalysts, Numerical analysis, Integral equations, Boundary layer, Hypersonic flow

A complete discussion is presented of the chemically reacting laminar boundary layer. Included in the study are separate homogeneous and hetergeneous reactions; additionally there is considered the problem of simultaneous gas phase and wall reaction. The basic solution, under conditions of unit transport properties, i.e., mass density-viscosity product constant, Prandtl number and Schmidt unity, were derived using previous devised operator techniques. For gas phase reaction the solution for the species distribution is seen to reduce to an integral equation; the temperature arising by quadrature. It is shown that simple first order results for chemistry of the usual complexity occuring in hypersonic boundary layer flows can be obtained without resort to large scale computation. The flow over a catalytic wall are derived from unit solutions to the basic problem. Using the present techniques any distribution of wall catalycity is permissable including discontinuities. Results of this analysis are shown to agree well with previous solutions. In all cases extension to non-unity transport properties are presented. Except in limited studies these extensions are not carried out because analyticity of all solutions was desired. Since no previous solution to the combined problem are available, new first order results were obtained corresponding to the leading edge solution. (Author)

9. Fluid Mechanics

AD-605 185 Div. 9, 1
OTS Prices: HC $9.20/MF $2.50

Norair Div., Northrop Corp., Hawthorne, Calif.
SUMMARY OF LAMINAR BOUNDARY LAYER CONTROL RESEARCH, VOLUME I.
Rept. for Jul 59-Mar 63.
Mar 64, 618p
Contract AF33 616 7564, Proj. 1366, Task 136612
ASD TDR63 554 V1

Unclassified report

Descriptors: (*Boundary layer control, Laminar boundary layer), (*Laminar boundary layer, Boundary layer control), Supersonic flow, Subsonic flow, Laminar flow, Drag, Oscillation, Stability, Wings, Flat plate models, Bodies of revolution, Reynolds number, Shock waves, Fluid mechanics, Aerodynamic characteristics.

At subsonic speeds, full length laminar flow and low drags were obtained up to high length Reynolds numbers on a thin straight, on a swept laminar suction wing and on a suction body of revolution. Moderately increased suction rates in the most critical region of a straight and a swept laminar suction wing enabled full chord laminar flow in the presence of external sound. Theoretical investigations are concerned with nonlinear boundary layer oscillations and stability investigations (assuming small disturbances) of a supersonic laminar boundary layer on a flat plate up to high supersonic speeds as well as on a highly swept supersonic low drag suction wing of low wave drag. On a supersonic flat laminar suction plate with and without weak incident shock waves, extensive laminar flow and low equivalent drags were obtained at M = 3 up to length Reynolds numbers of 26 x 1000000. Further supersonic low drag suction experiments on a suction body of revolution, on a 36 degree supersonic yawing wing, as well as on a 72 degree supersonic yawing wing (swept behind the Mach cone) of low wave drag, are described. The latter wing showed full chord laminar flow with a subsonic type pressure distribution at M = 2 and R sub C approximately equal to 1000000. (Author)

AD-605 186 Div. 9, 1
OTS Prices: HC $8.85/MF $2.50

Norair Div., Northrop Corp., Hawthorne, Calif.
SUMMARY OF LAMINAR BOUNDARY LAYER CONTROL RESEARCH, VOLUME II.
Rept. for Jul 59-Mar 63.
Mar 64, 582p
Contract AF33 616 7564, Proj. 1366, Task 136612
ASD TDR63 554 V2

Unclassified report

See also AD-605 185

Descriptors: (*Boundary layer control, Laminar boundary layer), (*Laminar boundary layer, Boundary layer control), Supersonic flow, Flat plate models, Suction slots, Ogives, Cylindrical bodies, Swept wings, Laminar flow, Airfoils, Boundary layer control systems, Ducted bodies, Structural properties, Aerodynamic characteristics.

AD-605 207 Div. 9, 15
OTS Prices: HC $3.00/MF $0.75

Douglas Aircraft Co., Inc., Long Beach, Calif.
EXTENSION OF THE DOUGLAS NEUMANN PROGRAM TO PROBLEMS OF LIFTING, INFINITE CASCADES,
by Joseph P. Giesing. Rev. 2 Jul 64, 86p LB-31653
Contract Nonr4308 00

Unclassified report

Descriptors: (*Fluid flow, Cascade structures), (*Cascade structures, Fluid flow), (*Numerical methods and procedures, Fluid mechanics), Theory, Equations, Numerical analysis, Programming (Computers), Graphics.

The Two-Dimensional Douglas Neumann Program for calculating the potential flow about bodies of arbitrary shape has been extended to handle lifting, infinite cascades. The resulting very general program allows a wide range of heretofore intractable problems to be solved. Essentially, the program can handle any problem in which the flow pattern repeats indefinitely along an axis. In the Douglas Neumann program this axis is the y-axis. This permits the calculation of the flow about a lifting or nonlifting cascade having any stagger angle and spacing and having arbitrary blade geometry. The program can also calculate the flow about more than one cascade. Thus it can handle the interaction problem of two or more parallel cascades. The Douglas Cascade Program is compared with other theoretical methods, special analytical cases, and experimental data. Program details, among which are input-output format and FORTRAN listing are given in the appendices. (Author)

AD-605 249 Div. 9, 30
OTS Prices: HC $4.00/MF $0.75

RAND Corp., Santa Monica, Calif.
BLUNTNESS AND VISCOUS-INTERACTION EFFECTS ON SLENDER BODIES AT HYPERSONIC SPEEDS,
by C. F. Dewey, Jr. Sep 64, 126p RM-3832-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Slender bodies, Aerodynamic characteristics), (*Hypersonic flight, Slender bodies), Blunt bodies, Viscosity, Heat transfer, Friction, Lift, Drag, Equations, Graphics.

This Memorandum is concerned with the aerodynamic design and performance of slender vehicles operating in high-altitude, high-velocity environments. A brief description of the pertinent regimes of flight is presented, and arguments are advanced to show that at high altitudes, the leading-edge thickness is not dictated by convective and radiative heat-transfer rates. This conclusion is based on the fact that the use of advanced surface materials will allow the heat transferred to the nose to be reradiated and conducted along the surface to regions of less intense heating while maintaining good thermal-insulation characteristics in a direction normal to the body surface. The flight regimes where leading-edge bluntness and hypersonic viscous interaction are important are described, and a summary of the theoretical approaches to these two limiting cases is given. A method of computing skin friction, heat transfer, and surface pressure in the viscous-interaction regime is outlined. Sample calculations are presented which indicate that viscous interaction may significantly increase the lift and drag of slender vehicles. (Author)

AD-605 284 Div. 9, 15
OTS Prices: HC $4.00/MF $0.75

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
THE CALCULATION OF NONLINEAR SUPERSONIC CONICAL FLOWS BY THE METHOD OF INTEGRAL RELATIONS,
by John W. Brook. Jul 64, 118p
Contract AF33 657 7313, Proj. 8219, Task 821902

AD-605 433 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Johns Hopkins Univ., Baltimore, Md.
ON THE BOUSSINESQ APPROXIMATION AND ITS ROLE IN THE THEORY OF INTERNAL WAVES.
Technical rept. nos. 17 and 20,
by Robert R. Long. Sep 64, 24p
Contract Nonr4010 01; Grant WBG21, Proj. NR082 104
Unclassified report

Descriptors: (*Fluid mechanics, Numerical analysis), (*Gravity, Fluid mechanics), Equations, Motion, Propagation, Velocity, Fluid flow, Liquids.

Most studies of the dynamics of fluids with weak density gradients use the Boussinesq approximation, which neglects density variations in the inertial terms of the equations of motion. The significance of this approximation is investigated. As a general matter, care is called for in the use of the approximation if quantities other than the non-dimensional density difference are small. Also, the very existence of certain phenomena of interest and importance may depend on the small terms neglected by the Boussinesq approximation. This is illustrated by an investigation of solitary waves in a stratified fluid system. (Author)

AD-605 441 Div. 9, 30
OTS Prices: HC $4.00/MF $0.75

Tennessee Univ., Knoxville.
A NUMERICAL SOLUTION OF VISCOUS COMPRESSIBLE FLOW IN SLENDER CHANNELS.
Master's thesis,
by William Allen Myers. Jun 64, 117p
Unclassified report

Descriptors: (*Compressible flow, Numerical analysis), Adiabatic gas flow, Partial differential equations, Programming (Computers), Momentum, Energy, Slender bodies.

Procedures and results are given for the numerical solution of viscous compressible flow in a slender channel. The results are compared with an exact solution developed through similarity. Two methods, normal implicit method and Crank-Nicolson method, were attempted in the numerical solution. The Crank-Nicolson method was found to be superior to the normal implicit method. The normal implicit method did have the advantage of requiring less computation time since the momentum and energy equations were solved separately by two sets of (N-2) equations with (N-2) unknowns. The normal implicit method also made possible the use of a smaller transverse grid size.

AD-605 498 Div. 9, 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOME EFFECTS RELATED TO THE MULTICOMPONENT NATURE OF GAS MIXTURES,
by N. A. Amfinov. 24 Jul 64, 15p
FTD TT64 198; TT 64 71323
Unclassified report

Unedited rough draft trans. of Akademiya Nauk SSSR. Izvestiya. Mekhanika i Mashinostroenie, 1963, no. 5, p. 117-123.

Descriptors: (*Gas flow, Diffusion), (*Diatomic molecules, Dissociation), Gases, Mixtures, Air, Oxygen, Nitrogen, Nitrogen compounds, Oxides, Boundary layer, Chemical reactions, Blunt bodies, USSR.

Consideration is given to the flow past an impenetrable surface of a mixture of two extraneous gases, one of which consists of two-atom molecules and can dissociate into atoms. It has been shown that the difference in the coefficients of diffusion of the separate components lead to a diffusion breakdown of the mixture of gases. Results are presented of the numerical solution for air considered as a gas of three components, O, O2, and N2. Analogous results are presented for five-component air with the addition of nitrogen and nitrogen oxide. On the basis of the numerical solutions, there are determined Lewis's numbers computed in accordance with generalized coefficients of diffusion. It is shown that inside the boundary layer Lewis's generalized number for molecular nitrogen changes from -infinity to + infinity.

AD-605 514 Div. 9, 27
OTS Prices: HC $4.00/MF $0.75

Ordnance Research Lab., Pennsylvania State Univ., University Park.
TIP CLEARANCE FLOW IN TURBOMACHINES,
by W. S. Gearhart. 27 Aug 64, 117p
ORL(PSU) TM-506.2491-04
Contract NOw63 0209c
Unclassified report

Descriptors: (*Fluid flow, Turbines), (*Turbines, Fluid flow), Rotor blades (Turbomachinery), Tolerances (Mechanics), Cavitation, Hydrodynamics, Test methods, Experimental data.

Two forms of cavitation have been recorded and attributed to the tip clearance flow. Cavitation resulting from this flow in the clearance area between the blade end and guide wall has been termed 'gap cavitation'. A second form of cavitation originates from the interaction of the tip-leakage flow and main flow in the blade passage. This form of cavitation termed the 'tip vortex cavitation' occurs initially as a small 'feather' of cavitation attached to the leading edge tip of the blade, and as the local pressure is further reduced, the feather grows into a distinct cavity which extends from the leading edge of the blade and diagonally across the blade passage. Both forms of cavitation are considered in this report but primary effort was directed towards a study of 'gap cavitation'. (Author)

AD-605 570 Div. 9, 15, 30
OTS Prices: HC $1.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
A PRINCIPLE OF MAXIMUM UNIFORMITY OBTAINED AS A THEOREM ON THE DISTRIBUTION OF INTERNAL FORCES.
by Paul Lieber. Apr 63, 17p MD-63-8
Contract Nonr222 87
Unclassified report

Paper presented as lecture at Technion, Haifa (Israel) in 1957, at Weizman Inst., Rehovoth (Israel) in 1958, and to the Seminar of Applied Mechanics, Univ. of California, Berkeley in 963.

Descriptors: (*Fluid mechanics, Mathematical analysis), Gases, Dynamics, Theorems, Partial differential equations.

This paper identifies and establishes a fundamental theorem on the spatial global and temporal local distribution of internal forces for a class of dynamical systems which includes the Maxwell gas. The theorem is based on a formulation of the Gauss-Hertz principle of mechanics where concept force is indeed retained and underlined. Thus we find and establish within the framework of Gauss' Mechanics a new and fundamental global property of

AD-605 324 Div. 9, 30
OTS Prices: HC $6.00/MF $1.25

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
THE CALCULATION OF TWO- AND THREE-DIMENSIONAL INVISCID UNSTEADY FLOWS BY THE METHOD OF CHARACTERISTICS.
Final scientific rept.,
by Harry Sauerwein. Jun 64, 244p FDRG-64-4
Grant AF AFOSR156 64, Proj. 9995
AFOSR 64 1055

Unclassified report

Descriptors: (*Gas flow, Numerical analysis), Hypersonic flow, Two-dimensional flow, Three-dimensional flow, Programming (Computers), Programming languages, Digital computers, Difference equations, Cylindrical bodies.

The problem of the numerical solution by the method of characteristics of the two- and three-dimensional flow of an inviscid nonequilibrium gas is formulated. For unsteady flows the method is limited, for practical reasons, to the solution of hypersonic or other flows which have short transient times. The specific details of the finite difference network and the associated finite difference equations are presented. It was found that numerical instability was possible with certain previously proposed networks. An existing stability criterion was found to apply to the multidimensional method of characteristics and this criterion was used to synthesize a stable finite difference network. High speed digital computer programs are presented which perform the numerical calculation. Four example cases of the flow about a circular cylinder with its axis perpendicular to a Mach five free stream are presented.

AD-605 364 Div. 9
OTS Prices: HC $2.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
A REPRESENTATION OF ROTATION AND CURVATURE IN FLUID FLOWS AND CONNECTION WITH VORTICITY AND DISSIPATION,
by Paul Lieber and Kirit Yajnik. 11 Mar 64, 46p
MD-63-7
Contract Nonr222 87

Unclassified report

Descriptors: (*Fluid flow, Tensor analysis), Rotation, Incompressible flow, Vortices, Turbulence, Motion, Velocity, Algebra.

The report attempts to show connections between vorticity, the rotation of a line element, the curvature of a streamline and dissipation in viscous fluid flows. A tensor of third rank is shown to determine the angular velocity of a differential element of a filament (curve) of a moving material, if the current direction of the differential element is known. The same tensor determines the curvature of streamline at a point, if the velocity of the fluid at that point is given. Dilatation does not influence the tensor. The dissipation function of an incompressible Newtonian fluid can be expressed in terms of its second order invariants. The report also includes other properties of the tensor such as algebraic properties. (Author)

AD-605 380 Div. 9
OTS Prices: HC $2.00/MF $0.50

Aerodynamic Lab., Ohio State Univ. Research Foundation, Columbus.
HYPERSONIC BLUNT BODY SIMILITUDE IN A PERFECT GAS,
by G. M. Gregorek and K. D. Korkan. Jun 64, 44p
Contract AF33 657 10416, Proj. 1426, Task 142604
FDL TDR64 92

Unclassified report

Descriptors: (*Blunt bodies, Hypersonic flow), Spheres, Cylindrical bodies, Gases, Shock waves, Pressure, Hypersonic wind tunnels, Correlation techniques, Reynolds number.

The strong similitude of the hypersonic flow of a perfect fluid about blunt bodies is considered. Using a continuous flow wind tunnel, the pressure distribution, shock-wave shape, and shock detachment distances about spheres and cylinders are obtained at Mach numbers from 8 to 15 and at Reynolds numbers from 2,000 to 75,000. With the help of low Mach number data from the open literature, correlations of the observed quantities are formulated, demonstrating a near Mach number independence of the flow. A correlation of the sphere shock profile by the normal shock density ratio is of special interest. (Author)

AD-605 403 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON METHOD OF SMALL PERTURBATIONS IN PROBLEMS OF FLOW AROUND SLENDER BLUNT BODIES BY A HYPERSONIC FLOW OF GAS,
by V. V. Sychev. 3 Sep 64, 22p
FTD MT64 59, TT 64 71304

Unclassified report

Edited machine trans. of Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (USSR) 1962, no. 6, p. 50-59.

Descriptors: (*Perturbation theory, Gas flow), (*Blunt bodies, Hypersonic flow), (*Hypersonic flow, Blunt bodies), Gas flow, Perturbation theory, Entropy, Aerodynamic heating, Numerical analysis, Bodies of revolution, Dynamics, Fluid mechanics, Shock waves, Aerodynamic configurations, USSR.

AD-605 413 Div. 9
OTS Prices: HC $3.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
BOUNDARY LAYERS IN ROTATING FLOWS.
General research,
by Nicholas Rott and W. S. Lewellen. 4 Sep 64, 57p
ATN-64(9227)-6

Unclassified report

Descriptors: (*Boundary layer, Vortices), (*Vortices, Boundary layer), Laminar flow, Axially symmetric flow, Turbulence, Incompressible flow, Rotation, Momentum, Mathematical analysis.

A survey of work on rotating boundary layers on axisymmetric bodies is given. Exact similarity solutions are discussed and the limits for which the effects of transverse pressure gradient and curvature become predominant are noted. A general momentum-integral solution for both laminar and turbulent flow is presented, using a simplified form obtained from the generalization of similarity properties to include shear laws applicable in turbulent flow. The interaction of the boundary layer and the outer flow is discussed and solved for some examples of enclosed flows. Implications of such an interaction for certain aspects of the tornado problem are noted. (Author)

istics), Numerical analysis, Pressure, Drag, Lift, Moments, USSR.

Topics include: pressure coefficient on a thin cone at very high Mach numbers; approximation of magnitude of pressure coefficient on the surface of a solid of revolution with arbitrary generatrix; approximation of magnitude of wave-drag coefficient; approximate evaluation of magnitude of lift coefficient; approximation of magnitude of moment coefficient and coefficient of center of pressure.

AD-605 593 Div. 9
OTS Prices: HC $2.00/MF $0.50

Polytechnic Inst. of Brooklyn, N. Y.
THE EFFECT OF VARIABLE TRANSPORT PROPERTIES ON A DISSOCIATED BOUNDARY LAYER WITH SURFACE REACTION,
by Gerald S. Janowitz and Paul A. Libby. Oct 63, 38p PIBAL-804
Contract AF49 638 217, Proj. 9781

Unclassified report

Descriptors: (*Transport properties, Boundary layer), (*Boundary layer, Transport properties), (*Heat transfer, Boundary layer), High altitude, Hypersonic flight, Viscosity, Conductivity, Diffusion, Surface properties, Theromodynamic properties, Aerodynamic heating, Hypersonic flow, Equations, Laminar boundary layer.

A study is made of the alteration in surface heat transfer and in the profiles of the flow variables associated with several descriptions of the transport properties of a dissociating gas. A boundary layer of the similar type is considered; a reasonably accurate description of the viscosity, conductivity and diffusivity of a mixture of atoms and molecules is employed along with several approximate descriptions which have been employed in the past. Numerical examples corresponding to high altitude hypersonic flight are considered and indicate that alterations of heat transfer of up to 60% and of the profiles of possible significance can occur depending on the description of the transport properties employed. (Author)

AD-605 595 Div. 9
OTS Prices: HC $6.00/MF $1.25

Johns Hopkins Univ., Baltimore, Md.
TWO TURBULENT SHEAR FLOWS. I. A PLANE JET. II. A Radial Jet,
by Gunnar Heskestad. Jun 63, 202p
Contract AF49 638 248

Unclassified report

Descriptors: (*Jets, Turbulence), (*Turbulence, Jets), Fluid flow, Velocity, Configuration, Measurement, Anemometers, Reynolds number, Equations.

Results from hot-wire measurements in a plane turbulent jet and a radial turbulent jet are reported. The plane jet was found to be approximately self-preserving sufficiently far downstream, where measurements of the intermittency and data for calculating the energy balance of the turbulent motion were made. Measurements were also made of the Reynolds number effect on the centerline development of the turbulent intensity and the flatness factor of the velocity derivative at a fixed downstream centerline-location. The radial jet was observed not to attain the degree of self-preservation noted for the plane jet in the range of the measurements. The mean velocity profiles were quite similar, but the meansquare turbulent velocity profiles were similar only away from the centerline, and the lateral intermittency distributions were highly dissimilar. Data for the energy balance was obtained at a convenient downstream location. (Author)

AD-605 608 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVESTIGATION OF THE INFLUENCE OF RAREFACTION OF SUPERSONIC FLOW ON READINGS OF PROBES OF TOTAL PRESSURE,
by S. I. Kosterin, N. I. Yushchenkova, N. T. Belova, and B. D. Kamaev. 9 Mar 64, 18p
FTD MT63 247; TT 64 71345

Unclassified report

Edited machine trans. of Inzhenerno-Fizicheskii Zhurnal (USSR) 1962, v. 5, no. 12, p. 16-22.

Descriptors: (*Pitot tubes, Measurement), (*Supersonic flow, Gas flow), Pressure, Density, USSR.

Results are presented of investigation of the influence of rarefaction of supersonic flow on the magnitude of total pressure, measured by a probe of total pressure with a thin wall and a small exterior angle of slant. (Author)

AD-605 611 Div. 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ON THE MOTION OF A CONTAINER PARTIALLY FILLED WITH LIQUID; EFFECTS OF NONSMALLNESS OF LIQUID MOTION,
by G. S. Narimanov. May 60, 24p STL-T-Ru-18
TT 64 71347

Unclassified report

O Dvizhenii Simmetrichnogo Giroskopa, Polost' Kotorogo Chastichno Zapolnena Zhidkost'yu, trans. of Prikladnaya Matematika i Mekhanika (USSR) 1957, v. 21, no. 5, p. 696-700.

Descriptors: (*Gyroscopes, Motion), (*Oscillation, Mathematical analysis), Containers, Equations, Fluid flow, USSR, Liquids, Stability.

The paper describes an approximate method of accounting for the influence of the nonsmallness of the parameters of motion of a liquid partially filling the cavity of a rigid body. (Author)

AD-605 612 Div. 9, 27
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE EXPANSION OF A RAREFIED GAS INTO A VACUUM. Revised ed.,
by P. Molmud. 1 Jul 59, 37p

Unclassified report

Descriptors: (*Rocket motors, Exhaust gases), (*Exhaust gases, Superaerodynamics), Vacuum, Particles, Momentum, Energy, Diffusion, Transformations (Mathematics).

AD-605 626 Div. 9, 25
OTS Prices: HC $2.00/MF $0.50

AVCO-Everett Research Lab., Everett, Mass.
HEAT TRANSFER TO A SPHERE AT THE TRANSITION FROM FREE MOLECULE FLOW,
by P. Hammerling and B. Kivel. Jun 58, 26p Avco-RN-75
Contract AF04 645 18

Unclassified report

Descriptors: (*Superaerodynamics, Heat transfer,

internal forces bearing on cooperative phenomena and which can be expressed as a Principle of Maximum Uniformity. Doing so, however, requires a demonstration of the validity of Gauss' Principle for all known categories of geometrical constraint. This is done here and attests to generality and power of principle. The information rendered explicit by the theorem cited is not discernable or obtainable from Newtonian Mechanics without quadrature. (Author)

AD-605 577 Div. 9
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
SUPERSONIC FLUTTER OF A CYLINDRICAL SHELL. I. GENERAL THEORY,
by John W. Miles. 19 Aug 55, 40p RW-66-147; RW(AM)-5-2

Unclassified report

Descriptors: (*Flutter, Cylindrical bodies), (*Supersonic flow, Cylindrical bodies), Mechanical waves, Velocity, Stresses, Damping, Surface properties, Aerodynamic characteristics, Laminar boundary layer, Turbulent boundary layer, Aerodynamic configurations, Thickness, Equations, Theory, Structural shells.

The equations governing the generation of traveling waves along an infinite, thin, cylindrical shell by an external air stream are formulated. The subsidiary problems of transverse wave propagation along the free shell and the calculation of the aerodynamic forces associated with a given wave then are solved. It is found that the minimum wave speed for the free shell occurs at a wavelength of the order of the geometric mean of shell thickness and radius. This neighborhood, in which flexural and extensional stresses are approximately equal in magnitude, is anticipated as the most critical for panel flutter (unstable wave motion). The restriction to wavelengths that are short compared with both length and radius of shell permits a relatively simple, quasi-planar approximation to the aerodynamic forces. The stability boundary for panel flutter in the absence of external damping is calculated and numerical results presented for shell thickness/radius ratio vs. Mach number. The negative damping ratio for unstable motion than is calculated and plotted vs a dimensionless dynamic pressure. It is shown that the structural damping ratio required to prevent panel flutter is equal to this negative damping ratio. (Author)

AD-605 579 Div. 9, 15
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
HIGHER ORDER TERMS FOR THE NAVIER-STOKES EQUATIONS IN THE ANALYSIS OF SHOCK WAVE STRUCTURE,
by E. V. Laitone. 13 Sep 55, 31p

Unclassified report

Descriptors: (*Shockwaves, Mathematical analysis), (*Partial differential equations, Shock waves), Kinetic theory, Gases, Viscosity, Thermal properties, Statistics, Numerical analysis.

The theoretical reasons underlying the introduction of the so-called bulk viscosity into the Navier-Stokes equations are briefly discussed. It is then pointed out that the higher order kinetic theory approximations attempting to improve the Navier-Stokes equations have not included all of the terms of the proper order because of the assumed form for the expansion of the distribution function, and the fact that the Boltzmann statistics should be modified to account for the non-linear density gradients. It is pointed out that the only term that can be legitimately added to the Navier-Stokes equations is the effect of thermal transpiration as first derived by Maxwell. When this term is correctly added it should be possible to obtain a valid solution for the analysis of shock wave structure. (Author)

AD-605 582 Div. 9
OTS Prices: HC $1.00/MF $0.50

Iowa Inst. of Hydraulic Research, Iowa City.
A PRELIMINARY STUDY OF THE EFFECT OF THE FREE SURFACE ON THE DRAG OF A TRUNCATED 2:1 ELLIPSOID,
by Arthur D. Newsham. Aug 64, 18p
Contract Nonr1509 05

Unclassified report

Descriptors: (*Ellipsoids, Drag), (*Drag, Ellipsoids), Underwater, Towed bodies, Cavitation, Yaw, Hydrodynamics, Experimental data.

The study of the drag force on truncated, axisymmetric, supercavitating bodies near a free surface involved the design, construction, and checking of the apparatus and instrumentation necessary to conduct the experiments. A truncated 2:1 ellipsoid at zero angle of yaw was chosen for the initial investigation. The drag of this body at zero angle of yaw was measured and compared with existing data for a 2:1 ellipsoid completely submerged. In addition, some preliminary work concerning the effect of the proximity of the free surface was performed.

AD-605 583 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
A DYNAMICAL THEORY OF INTERACTING CONTINUA,
by A. E. Green and P. M. Naghdi. Jul 64, 19p
AM-64-13
Contract Nonr222 69, Proj. NR064 436

Unclassified report

Descriptors: (*Continuum mechanics, Dynamics), Fluid mechanics, Diffusion, Thermodynamics, Entropy, Energy, Equations, Invariance, Inequalities.

A dynamical theory of the flow relative to each other of two continua (which includes a dynamical theory of diffusion) is developed from an energy equation and the use of invariance conditions under superposed rigid body motions, together with an entropy production inequality. (Author)

AD-605 587 Div. 9
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AN APPROXIMATION OF AERODYNAMIC COEFFICIENTS OF THIN BODIES OF REVOLUTION MOVING AT VERY GREAT SUPERSONIC SPEEDS,
by N. F. Krasnov. 9 Mar 64, 320
FTD MT63 169; TT 64 71333

Unclassified report

Edited machine trans. of Moskovskoe Vysshee Tekhnicheskoe Uchilishche. Trudy (USSR) 1955, v. 32, p. 75-99.

Descriptors: (*Bodies of revolution, Aerodynamic characteristics), (*Supersonic flight, Aerodynamic character-

by R. E. Kelly. Jun 64, 132p FDRG-64-3
Grant AF AFOSR156 63
AFOSR 64 1662

Unclassified report

Descriptors: (*Fluid mechanics, Stability), (*Panels (Structural), Flutter), Oscillation, Resonance, Fluids, Incompressible flow, Damping, Numerical analysis, Differential equations, Motion, Fluid dynamic properties.

The report concerns the possible amplification of waves in fluids due to fluctuations with time of some parameter which defines in part the natural frequencies of the system. Resonance is most likely to occur when some characteristic frequency is half of the frequency of parametric variation. First, the fluid is taken to be within a container which oscillates in the vertical direction so that the gravitational acceleration, relative to the container, varies with time. Both surface waves, in the case of an interface, and internal waves, in the case of continuous variation of density, are considered. In the latter case, the possible resonant frequencies have an upper bond. For an interface, rotation tends to eliminate the resonance of surface waves but to promote the resonance of inertial waves. For a continuous variation of density, rotation tends to place a lower bond on the possible resonant frequencies. Secondly, two fluids of different densities are taken to flow parallel to each other in an oscillatory manner and with different mean values of velocity. (Author)

AD-605 759 Div. 9
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
ON PANEL FLUTTER IN THE PRESENCE OF A BOUNDARY LAYER,
by John W. Miles. 20 Dec 57, 64p STL-GM-TR-299
Contract AF18 600 1190

Unclassified report

Descriptors: (*Flutter, Boundary layer), (*Panels (Structural), Flutter), Transport properties, Energy, Supersonic flow, Stability, Monocoques, Structural shells, Equations, Numerical analysis.

The energy transfer from the uniform flow outside a boundary layer to a transverse surface wave at the boundary is calculated on the hypothesis that the boundary layer may be represented by an inviscid, approximately parallel shear flow. This energy transfer is found to consist of two components; the first is similar to that found previously for supersonic panel flutter in the absence of a boundary layer and is relatively diminished by the presence of the boundary layer; the second is intrinsic to the shear flow and is present whenever the surface wave speed is smaller than the free stream speed (whether subsonic or supersonic). The application of the results to actual flutter calculations is discussed and an example of a pressurized cylinder considered. It is concluded that the presence of a typical boundary layer may reduce the degree of instability for supersonic flutter of a long, monocoque shell by an order of magnitude, thereby providing a possible explanation of discrepancies between earlier theories (in which boundary layer effects were neglected) and observation. (Author)

AD-605 760 Div. 9
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
COMPRESSIBLE FLAT PLATE BOUNDARY LAYER FLOW WITH AN APPLIED MAGNETIC FIELD,
by William B. Bush. 19 Aug 58, 42p
STL-GM-TR-0165-00466
Contract AF04 647 165

Unclassified report

Descriptors: (*Laminar boundary layer, Magnetic fields), (*Compressible flow, Laminar boundary layer), Gas flow, Covette flow, Heat transfer, Friction, Aerodynamic heating, Transport properties, Flat plate models, Gas ionization, Dissociation, Equations, Mathematical analysis.

The laminar boundary layer equations are formulated and solved for a flat plate in high speed compressible air flow where equilibrium dissociation and ionization are assumed and where there is an applied magnetic field having its component normal to the plate proportional to 1/ square root of x. The skin friction and heat transfer characteristics are determined for free stream velocities of up to 17,500 meters/sec and magnetic fields of up to about 1 Weber/ sq m. The results show that the skin friction and heat transfer at a given free stream velocity decrease with increasing magnetic field strength and the percentage reduction is constant along the length of the plate. They also exhibit the same hysteresis behavior as was first found in the case of magneto-aerodynamic Couette flow; however, for the flat plate the hysteresis effect disappears at a higher Mach number. Furthermore, it was found that the reduction in heat transfer with increasing field strength is opposite in behavior from that for Couette flow. (Author)

AD-605 761 Div. 9, 25
OTS Prices: HC $5.00/MF $1.00

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THERMODYNAMICS OF GAS FLOW.
Lecture notes,
by D. H. Daley. Jul 56, 160p
AFIT ME257

Unclassified report

Descriptors: (*Gas flow, Thermodynamics), (*Thermodynamics, Gas flow), Fluid mechanics, Incompressible flow, Acoustics, Velocity, Nozzles, Pressure, Temperature, Shock waves, Supersonic diffusers, Momentum, Equations.

Contents: Conservation of mass; Newton's second law of motion and the momentum equation; first law of thermodynamics; combination of the laws of thermodynamics and of fluid mechanics for incompressible fluid flow; the velocity of sound; total pressure and total temperature; nozzle design; nozzle operating characteristics; simple area flow; compressibility phenomena; normal shock wave; oblique shock wave; simple frictional flow; simple T sub o flow; supersonic diffusers; steadily moving shock wave.

AD-605 763 Div. 9, 4, 25
OTS Prices: HC $3.00/MF $0.75

Cornell Univ., Ithaca, N. Y. Graduate School of Aerospace Engineering.
APPROACH TO EQUILIBRIUM IONIZATION BEHIND STRONG SHOCK WAVES IN ARGON,
by Harry Petschek and Stanley Byron. [1955] 74p
Contract Nonr401 25
PB 132 496

Unclassified report

Descriptors: (*Argon, Ionization), (*Shock waves, Gas ionization), Thermodynamics, Chemical equilibrium, Impurities, Plasma medium, Electrons, Atoms, Spectro-

(*Heat transfer, Spheres), Mathematical models, Drag, Thermodynamics, Nuclear scattering, Probability, Geometry, Particles, Kinetic theory, Gas flow, Energy, Surface temperatures.

The high speed flow of a rarified gas about a sphere is considered. In such a flow the reflected molecules are moving relatively slowly and form a region near the body whose density is greater than the free stream density. The presence of the denser layer near the body introduces the possibility of collisions with the incident stream which can alter the expected momentum and energy transfer. The important role of surface temperature in these results is noted. For lower surface temperature the emitted particles move away more slowly. By continuity their density is increased and their mean-free path is decreased. This makes scattering events occur closer to the surface and leads to greater breakdown of free molecule flow.

AD-605 630 Div. 9, 1, 12, 14
OTS Prices: HC $1.00/MF $0.50

Chicago Midway Labs., Univ. of Chicago, Ill.
DETERMINATION OF FACTORS GOVERNING SELECTION AND APPLICATION OF MATERIALS FOR ABLATION COOLING OF HYPERVELOCITY VEHICLES.
Data rept.,
by Channon F. Price. 20 Oct 58, 18p CML-DR-M131-14
Contract AF33 616 5436

Unclassified report

Descriptors: (*Materials, Ablation), (*Ablation, Materials), (*Nose cones, Ablation), Cooling, Experimental data, Boundary layer, Melting, Surface properties, Weight, Heat transfer.

Six samples were tested in the CML 1.5-inch air arc on 10 and 14 October 1958. All samples were positioned at 4-1/2 inches above the top electrode and were subjected to a step heat flux rate (nonablating value) or 1950 BTU/sq ft 2-sec for a nominal period of 30 seconds. Data shown are (1) heat flux rate, (2) plasma characteristics, (3) time of exposure, (4) sample weights before and after test, (5) percentage weight loss, (6) photographs of samples before and after test, (7) sample silhouettes before and after test. Remarks are appended where additional information was deemed advisable. (Author)

AD-605 644 Div. 9, 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
A NOTE ON GENERAL RELATIVISTIC INSTABILITY.
Technical summary rept.,
by J. P. Wright. May 64, 8p MRC-TSR-487
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Fluids, Relativity theory), (*Spheres, Fluids), Perturbation theory, Energy, Potential theory, Differential equations, Integration, Stability.

The point of instability of a general relativistic fluid sphere is determined using the criterion that the point of instability occurs when the binding energy is at a maximum. The result is equivalent to the result obtained by the small perturbation method when the radius is sufficiently large. (Author)

AD-605 697 Div. 9
OTS Prices: HC $2.00/MF $0.50

Philco Research Labs., Newport Beach, Calif.
STABILITY CHARACTERISTICS OF CONES AND CYLINDERS AT LARGE ANGLES OF ATTACK AT MACH NUMBER 2.87,
by Walter T. Davey and Carl E. Grigsby. 13 Aug 59, 32p U-540
Contract AF04 647 280
PB 158 322

Unclassified report

Descriptors: (*Conical bodies, Supersonic characteristics), (*Cylindrical bodies, Supersonic characteristics), (*Supersonic flow, Wind tunnel models), Slender bodies, Angle of attack, Stability, Center of gravity, Pitch (Motion).

The results of wind tunnel tests to determine the stable characteristics of slender cones and right circular cylinders at large angles of attack are presented at a test Mach number 2.87. Five cones of fineness ratio 4.5 with center of gravity locations 55.0 and 66.7 per cent body length were tested along with 3 cylinders of fineness ratios 5, 10, and 20. The L/d 4.5 cone models, which were suspended at the theoretical center of pressure, stabilized at the 0 degree angle of attack position if released from angles less than 50 degrees. When these configurations were released at angles greater than 50 degrees, a tendency to stabilize near the 90 degree position was indicated. The cone models which were suspended forward of the theoretical center of pressure (55 per cent) were quite stable and stabilized at 0 degree angle of attack for all release angles. The cylinder models stabilized at about 90 degrees angle of attack confirming the results of Raymond and Garber. (Author)

AD-605 725 Div. 9, 25
OTS Prices: HC $2.00/MF $0.50

Aerophysics Lab., Mass. Inst. of Tech., Cambridge.
HIGH SPEED VISCOUS AND REACTING FLOWS.
Final rept. for Apr 63-Jul 64.
Jul 64, 32p AL-TR98, DSR-9195
Grant AF AFOSR62 407
AFOSR 64 1616

Unclassified report

Descriptors: (*Thermal diffusion, Boundary layer), Injection, Turbulence, Fluid flow, Transport properties, Ablation, Aerodynamic heating, Surface properties, Thermal radiation, Viscosity, Shock waves, Blunt bodies, Nozzles.

The objective of these investigations was to consider several aspects of viscous and large temperature flow fields. Overall topic groups are as follows: (1) the mechanics of fluid injection for thermal protection, (2) the role of thermal diffusion in boundary layer mixtures, (3) the evaluation of thermal diffusion coefficients for turbulent conditions, (4) the solution of radiation coupled flows.

AD-605 728 Div. 9
OTS Prices: HC $4.00/MF $1.00

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
PARAMETRIC AMPLIFICATION OF SURFACE AND INTERNAL WAVES.
Final scientific rept.,

available for use in full-scale flight. The techniques described are adequate to give the aerodynamicist a good idea of the surface flow conditions as well as the potential flow field around and behind aircraft as a function of time. (Author)

AD-605 860 Div. 9, 30
OTS Prices: HC $6.00/MF $1.25

Engineering Projects Lab., Mass. Inst. of Tech., Cambridge.
RESEARCH IN PRESSURE-CONTROLLED FLUID JET AMPLIFIERS,
Final rept.,
by Forbes T. Brown and Anton K. Simson. Nov 63, 214p DSR-9213-1
Contract DA19 020ORD5659

Unclassified report

Descriptors: (*Amplifiers, Fluid flow), (*Hydraulic systems, Amplifiers), Control systems, Design, Liquid jets, Turbulence, Subsonic flow, Pressure, Control jets, Jet mixing flow, Jets, Deflection, Hydrodynamics, Water tunnels, Two-dimensional flow, Stability, Configuration.

A subsonic, pressure controlled, fluid jet amplifier is analyzed to determine the important design parameters. Once these parameters are known, they are considered in terms of stability, linearity, and gain, and observations are used to help determine the proper analytical models. Air models were also used to verify results. The analysis starts with a consideration of submerged jet representation. The various geometrical constraints are added one by one, and their effects predicted. Graphical presentations of results are freely used. (Author)

AD-605 863 Div. 9, 25
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TURBULENT HEAT AND MASS TRANSFER IN JET MOTION OF A GAS,
by L. A.Vulis. 17 Mar 64, 28p
FTD MT63 208; TT 64 71382

Unclassified report

Edited machine trans. of mono. Voprosy Aerodinamiki (Problems of Aerodynamics) n.p., 1958, p. 81-99.

Descriptors: (*Jets, Transport properties), (*Heat transfer, Gas flow), Turbulence, Thermal diffusion, Momentum, Incompressible flow, Boundary layer, Energy, Distribution, USSR, Reviews.

Topics include: 'Half-free' thermal (diffusion) streams, propagating in a hard wall; investigation of heat exchange in complex (Concurrent and counter, and also transverse and others) jets and in tracking a body; twisted flows, especially under the conditions of strong twisting. An explanation is given of the possibility of a generalization in the case of compressible twisted streams. (Author)

AD-605 875 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
BOUNDARY LAYER EQUATIONS AND BOUNDARY CONDITIONS FOR THEM IN THE CASE OF MOTION IN A SLIGHTLY RAREFIED GAS WITH SUPERSONIC SPEEDS
by Yu. P. Lun'kin. 16 Jan 64, 20p
FTD MT63 164; TT 64 71399 Unclassified report

Uravneniya Pogranichnogo Sloya i Granichnye Usloviya k Nim v Sluchae Dvizheniya v Slabo Razrezhennom Gaze so Sverkhzvukovymi Skorostyzmi, edited machine trans. of Prikladnaya Matematika i Mekhanika (USSR) 1957, v. 21, no. 5, p. 597-605.

Descriptors: (*Turbulent boundary layer, Supersonic characteristics), (*Boundary layer, Equations), (*Supersonic characteristics, Gas flow), Turbulence, Pressure, Fluid mechanics, Superaerodynamics, Molecular properties, Mathematical analysis, Partial differential equations, Kinetic theory, Supersonic flow, Motion, USSR.

By using Prandtl's boundary-layer theory, equations are derived for a moderately rarefied gas which differ from the ordinary Prandtl equations by the presence of supplementary terms that contain higher derivatives of velocity and temperature; in the equations derived, the normal pressure gradient differs from zero and is expressed by supplementary terms. The boundary conditions for these equations are found with the aid of kinetic theory; they are a generalization of Maxwell's and Smoluchowski's conditions for motion at a supersonic velocity. The velocity and height limits of applicability of the equations derived are set forth. (Author)

AD-605 877 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CALCULATION OF A TURBULENT BOUNDARY LAYER FOR SUBSTANTIAL POSITIVE PRESSURE GRADIENTS,
by S. S. Kytateladze and A. I. Leont'ev.
18 May 64, 18p
FTD MT64 49, TT 64 71401

Unclassified report

Edited machine trans. of Inzhenerno-Fizicheskii Zhurnal (USSR) 1962, v. 5, no. 1, p. 33-41.

Descriptors: (*Gas flow, Turbulence), (*Turbulent boundary layer, Mathematical analysis), Pressure, Boundary layer, Friction, Heat transfer, Diffusion, Momentum, Compressive properties, Energy, Fluid mechanics, Reynold number, Differential equations, USSR.

In this article is exponded a new method of calculation of a turbulent boundary layer, which is based on the boundary laws of friction and heat transfer in the diffusion region of a gas flow. There are obtained values of critical parameters at point of abruption of a turbulent boundary layer and the influence of heat transfer and compressibility of the gas on these parameters is established. It is shown that the law of heat transfer in the practical region of variation of the criterion Re** weakly depends on the pressure gradient. There are proposed methods of calculation of friction and heat transfer, based on the solution of integral relationships of momenta and energy with the use of boundary laws of friction and heat transfer. (Author)

AD-605 878 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DEFINITION OF BOUNDARY OF NUCLEUS OF FLOW AND COEFFICIENT OF PRESSURE RECOVERY IN SHORT ROUND CHANNELS,
by B. S. Vinogradov. 21 May 64, 10p
FTD MT63 296; TT 64 71402

Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh

scopy, Ionization potentials, Electrostatics, Diffusion, Dissociation, Hypersonic flow.

Previous work on strong shock waves in argon has shown that the degree of ionization reaches thermodynamic equilibrium for shock speeds greater than about ten times the speed of sound in room temperature argon. The degree of ionization reaches about 25% at the highest shock strengths available in an ordinary shock tube. This paper reports a detailed theoretical and experimental study of the approach of high temperature argon to this equilibrium degree of ionization. The mechanism for the approach to equilibrium can be divided into two stages. The first, which accounts for about 10% of the final ionization, is apparently controlled by impurities present in the gas even after considerable care is taken to insure high purity. In the second stage ionization by electron-atom collisions becomes dominant. The rate of ionization by this process is limited by the rate of energy transfer to electrons by elastic collisions with the atoms and ions in the gas and is relatively independent of the inelastic ionization cross-section. This rate is calculated and is in agreement with experimental measurements making use of (1) the visible continuum radiation from the gas, and (2) the electrostatic potentials in the gas due to the diffusion of electrons. (Author)

AD-605 771 Div. 9, 22
OTS Prices: HC $3.00/MF $0.75

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
THE FORCE OF IMPACT ON A SPHERE STRIKING A WATER SURFACE.
Approximation no. 2,
by R. Courant, Max Shiffman, and Donald C. Spencer.
Jul 45, declassified 1957, 88p AMG-NYU-133
Contract OEMsr945
AMP 42 2R; PB 19649

Unclassified report

Descriptors: (*Projectiles, Water entry), (*Spheres, Projectiles), (*Impact prediction, Spheres), Hydrodynamics, Drag, Impact shock, Penetration, Air-to-underwater, Energy, Momentum.

The entry of a solid body from air into water may take place in two ways: (i) if the speed is small and if the surface of the body is smooth, the entry occurs without the formation of a cavity (smooth entry); (ii) if the speed is great or if the surface of the body is rough or has an irregular shape, the flow detaches from the body when it has penetrated a short distance below the initial surface level (rough entry). In either case there is an initial period following contact with the surface during which the body experiences the greatest deceleration and which is of such short duration that cavitation has not yet developed. It is assumed that the nose of the projectile is spherical in shape and that the initial impact with the surface is vertical. The mass of the projectile is then visualized as concentrated into a sphere of the same radius as the nose. In a previous report (PB-19651) a first approximation was obtained to the force of impact on a sphere entering vertically by disregarding the rise of the surface; in the present report, a second approximation was obtained by estimating the effects of the surface motion and the theoretical estimates are compared with experimental results.

AD-605 798 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CALCULATION OF HEAT FLUXES IN THE FLOW OF TWO DIFFERENT SUPERSONIC STREAMS AROUND A SHOULDER,
by R. K. Tagirov. 27 Aug 64, 14p
FTD TT64 364; TT 64 71375

Unclassified report

Unedited rough draft trans. of Akademiya Nauk SSSR. Izvestiya. Mekhanika i Mashinostroenie, 1963, no. 6, p. 55-61.

Descriptors: (*Supersonic flow, Thermodynamics), (*Enthalpy, Partial differential equations), Boundary layer, Turbulence, Gas flow, Heat transfer, Blunt bodies, Surfaces, USSR.

A method is dealt with for determining the base enthalpy (or base temperature) in the flow around a flat or ring-shaped shoulder by two supersonic streams differing by the numbers M, full pressures and enthalpies of retardation. (Author)

AD-605 831 Div. 9, 15
OTS Prices: HC $2.00/MF $0.50

Technische Hochschule, Aachen (West Germany).
SOLUTION OF THE SOMMERFELD-SEXL CHARACTERISTIC EQUATION FOR THE STABILITY OF COUETTE FLOW.
Annual summary rept. no. 4, 1 Sep 63-31 Aug 64,
by F. Schultz-Grunow. Aug 64, 28p
Contract AF61 052 744
ARL 64 196

Unclassified report

Descriptors: (*Couette flow, Stability), (*Equations, Fluid mechanics), Differential equations, Transformations (Mathematics), Functions, Perturbation theory, Algebra, Bessel functions, Series, Polynomials, Fluid flow.

The Sommerfeld-Sexl transcendental equation which yields the stability parameters of Couette flow is first transformed. Then by introducing the Wronski determinant it is possible to eliminate the unknown Bessel functions of imaginary argument and imaginary order, which until then prohibited the solution of the original Sommerfeld-Sexl equation. A series expansion in the wall distance with the stability parameters in polynomial form was obtained which can be solved numerically for any modes and widths of the gap. For a ratio of the inner and outer radius of 2 stability was found for the first and third mode. (Author)

AD-605 848 Div. 9, 1
OTS Prices: HC $2.00/MF $0.50

Mississippi State Univ., State College.
FLOW-VISUALIZATION TECHNIQUES USED IN FULL-SCALE FLIGHT TESTS.
Aerophysics research rept. no. 49,
by Sean C. Roberts and Michael R. Smith. Jul 64, 40p
Contract DA44 177AMC892T, Proj. 1D121401A14203
TRECOM TR64 39

Unclassified report

Descriptors: (*Flow visualization, Flight testing), Aerodynamic characteristics, Laminar boundary layer, Boundary layer transition, Turbulent boundary layer, Drag, Smoke screens, Smoke bombs, Dust, Airplanes, Helicopters.

This report presents a description and evaluation of various flow visualization techniques that are now

energy transferred to the vehicle can be held to about the same value as for a nonlifting vehicle. Only modest lift-drag ratios are required beyond peak G to prevent the deceleration from exceeding the peak value, or to prevent the vehicle from skipping out of the Earth's atmosphere. Thus, the difficult guidance and control problem is greatly alleviated; in particular, for return from the Moon or other planets the necessity for multiple-pass drag braking is eliminated. (Author)

AD-605 958 Div. 9
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
ON THE SLOSHING OF LIQUID IN A CYLINDRICAL TANK,
by John W. Miles. 20 Apr 56, 22p AM 6-5, GM-TR-18
Unclassified report

Descriptors: (*Fluid mechanics, Sloshing), Liquids, Oscillation, Tanks (Containers), Cylindrical bodies, Boundary layer, Laminar boundary layer, Friction, Equations, Mathematical analysis.

The free oscillations of a slightly viscous liquid in a cylindrical tank (of arbitrary cross section) with a free surface are analyzed and the decrement of motion caused by laminar boundary-layer friction and time-varying depth calculated. An increasing or decreasing (in time) depth is shown to have a destabilizing or stabilizing effect, respectively, but the magnitude of this effect is negligible for practical configurations. The results are applied to a circular tank, and it is shown that the depth may be considered infinite when it exceeds the diameter. The sloshing oscillations in a 10-foot (diameter) tank are found to have a (longest) period of 1.8 seconds and, assuming the kinematic viscosity to be that of water at 20C, a time to damp to one-half amplitude of 7 minutes for mean amplitudes smaller than about 10 inches. The transverse, oscillatory force on the tank walls associated with a sloshing amplitude of one foot would have an amplitude of 2700 pounds and would act 2.7 feet below the mean surface. (Author)

AD-605 960 Div. 9, 2
OTS Prices: HC $1.00/MF $0.50

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
AN ESTIMATE OF THE TIME FOR A TRAIL TO DECAY TO A GAUSSIAN DISTRIBUTION,
by A. O. Kresse. 19 Dec 61, 12p
Bendix-BSC-28771, Bendix-FS-61TN-1017
Contract AF04 647 911
Unclassified report

Descriptors: (*Atmosphere entry, Electron density), (*Hypersonic test vehicles, Wake), Recombination reactions, Hypersonic flow, Diffusion, Plasma physics, Condensation trails, Temperature, Mathematical analysis, Bessel functions.

The radar signature of a hypersonic re-entry trail computed in an earlier work is considered. It is desired to investigate the time for a nongaussian distribution to decay to the gaussian form. To investigate this point it is desirable to make such assumptions as are required to permit a solution in closed form and yet not destroy all resemblance to reality. These assumptions and their meaning are specifically examined.

AD-605 982 Div. 9
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
THE HYDRODYNAMIC STABILITY OF A THIN FILM OF LIQUID IN UNIFORM SHEARING MOTION,
by John W. Miles. 18 Nov 59, 73p
STL-EM-9-26, STL/TR-59-0000-00892
Unclassified report

Descriptors: (*Liquids, Fluid dynamic properties), (*Films, Stability), Motion, Shear stresses, Surface properties, Reynolds number, Numerical analysis, Statistical data.

The stability problem for a thin film of liquid having a linear mean-velocity profile and bounded by a fixed wall and free surface is solved asymptotically for large values of the Reynolds number R. The analysis is similar to that for plane Couette flow, but instability occurs for sufficiently large values of R in accordance with Heisenberg's criterion that neutral disturbances having finite wave numbers and phase velocities for R = infinity are necessarily unstable as R approaches infinity. It is found that a sufficient condition for stability is W<3, where W is the Weber number based on the mean speed at the free surface and the depth of the film. The minimum critical Reynolds number, also based on free surface speed and film depth, is found to be R = 203. Brief consideration also is given to the time-rate-of-growth of unstable disturbances and to the lighter fluid that, in actual configurations, is responsible for the shear in the film. (Author)

AD-605 997 Div. 9, 10, 12
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
EQUIVALENCE OF SLOSHING WAVE HEIGHT TO PENDULUM ANALOGY ANGULAR DISPLACEMENT,
by L. E. Freed. 4 Oct 57, 5p GM-45.3-419
Unclassified report

Descriptors: (*Sloshing, Potential theory), (*Fluid mechanics, Sloshing), Fluid dynamic properties, Fuel tanks, Propellants, Motion, Gravity, Rotation, Guided missiles.

AD-606 000 Div. 9
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
DYNAMICS OF AN INCOMPRESSIBLE VISCOUS FLUID WITH A FREE SURFACE CONTAINED IN A CYLINDRICAL TANK,
by R. R. Berlot. 22 Mar 56, 17p GM-TN-2
Unclassified report

Descriptors: (*Incompressible flow, Mathematical analysis), Fluid dynamic properties, Fluid flow, Damping, Viscosity, Cylindrical bodies, Tanks (Containers), Surfaces, Particles, Equations.

The purpose of the analysis was to determine the normal modes of an incompressible viscous fluid with a free surface contained in a cylindrical tank, and the damping associated with these modes. The tank is assumed to be infinitely rigid and the motion is assumed to be sufficiently small that nonlinear terms in the Navier-Stokes equations can be neglected. The effects of surface tension are considered. (Author)

AD-606 003 Div. 9, 15
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
FORMULATION FOR MACHINE COMPUTING OF AXI-SYMMETRIC SUPERSONIC FLOW,
by H. E. Wohlwill. 26 Mar 57, 13p GM-TN-56
Unclassified report

Zavedenii. Aviatsionnaya Tekhnika (USSR) 1962, v. 5, no. 4, p. 151-154.

Descriptors: (*Gas flow, Boundary layer), (*Boundary layer, Gas flow), (*Pneumatic systems, Gas flow), Fluid flow, Nozzle gas flow, Pressure, Velocity, Equations, USSR.

Simple formulas which allow the position of boundary of nucleus of flow to be found with a minimum of experimental points and to calculate coefficient of pressure recovery are presented. These formulas are brought out for axially symmetric channels, but not excluded is the possibility of extending the method to other cases. Use of the given method is especially convenient in the case of use of pneumatometric combs or tubes, transferred automatically a given program.

AD-605 880 Div. 9, 1, 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
APPLICATION OF THE GALERKIN VARIATIONAL METHOD TO PROBLEMS OF FLUTTER OF ELASTIC PANELS,
by V. V. Bolotin. 26 Dec 63, 18p
FTD MT63 139; TT 64 71404
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Mashinostroenie (USSR) 1959, no. 12, p. 25-32.

Descriptors: (*Panels (Structural), Flutter), (*Flutter, Panels (Structural)), (*Calculus of variations, Boundary value problems), Supersonic characteristics, Elasticity, Aeroelasticity, Compressible flow, Equations, Algebra, Series, Airplane panels, USSR.

This work is devoted to the explanation of known paradox, connected with the application of the Galerkin variational method to problems of flutter of flat panels in a supersonic flow of gas. It shows that the Galerkin method gives reliable results in reference to plates with bend rigidity different than zero. (Author)

AD-605 900 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson, AFB, Ohio.
INFLUENCE OF SMALL DEVIATIONS OF CONSUMPTION IN CALCULATED CONDITIONS ON THE MAIN CHARACTERISTICS AND PARAMETERS OF STAGE OUTPUT ON FLOW OF AXIAL COMPRESSOR,
by V. N. Novotel'nov. 17 Mar 64, 16p
FTD MT64 95; TT 64 71421
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Energetika (USSR) 1962, v. 5, no. 12, p. 63-69.

Descriptors: (*Axial-flow compressors, Mathematical analysis), (*Aerodynamic properties, Axial-flow compressors), Velocity, Consumption, Fluid mechanics, Compressor blades, Dynamics.

AD-605 908 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRICAL EFFECTS ACCOMPANYING FLOW OF GAS IN SHOCK TUBE,
by Yu. V. Makarov and Yu. A. Polyakov.
26 Dec 63, 12p
FTD MT63 73; TT 64 71385
Unclassified report

Edited machine trans. of mono. Fizicheskaya Gazodinamika, Teploobmen i Termodinamika Gazov Vysokikh Temperatur (Physical Gas Dynamics, Heat Exchange and Thermodynamics of High Temperature Gases) Moscow, 1962, p. 270-274.

Descriptors: (*Shock waves, Gas ionization), (*Gas ionization, Electrical properties), Gas flow, Thermal diffusion, Voltage, Propagation, Oscillagraphs, Electron Density, Kinetic theory, Thermodynamics, Probes (Electromagnetic), Shock tubes, USSR, Blunt bodies.

During the passage of strong shock waves, a flow of thermal ionized gas will be formed behind the front. Processes of diffusion, developing in the front, can lead to large gradients of electric potential along the direction of propagation of the front which are very difficult to measure. Analogous processes of diffusion and thermal diffusion behind the shock front can, in the presence of walls, lead to the appearance of potential differences between the flow of ionized gas and the wall.

AD-605 926 Div. 9, 4
OTS Prices: HC $1.00/MF $0.50

Boeing Scientific Research Labs., Seattle, Wash.
UNSTEADY MASS TRANSFER WITH CHEMICAL REACTION. PART II. MORE GENERAL INITIAL AND BOUNDARY CONDITIONS,
Flight Sciences Lab. Technical rept.,
by Yih-Ho Pao. Jul 64, 13p D1-82-0365, FSL-89
Unclassified report

Also available from the author.

Descriptors: (*Fluid flow, Chemical reactions), (*Boundary layer, Chemical reactions), Reaction kinetics, Diffusion, Differential equations.

In a steadily flowing or stationary medium, the concentration fields of the reactants and the products of all types of first-order reactions with equal diffusivities are related to that of a non-reacting species for certain non-uniform initial conditions and non-similar boundary conditions. (Author)

AD-605 935 Div. 9, 12
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
THE USE OF AERODYNAMIC LIFT DURING ENTRY INTO THE EARTH'S ATMOSPHERE,
by Lester Lees, Frederic W. Hartwig, and Clarence B. Cohen. 20 Nov 58, 70p STL-GM-TR-0165-00519
Unclassified report

Rept. done on Air Force Contract.

Descriptors: (*Reentry vehicles, Lift), (*Atmosphere entry, Lift), Spacecraft, Drag, Aerodynamic heating, Heat transfer, Descent trajectories, Deceleration, Interplanetary trajectories.

By employing aerodynamic lift during entry into the Earth's atmosphere at either orbital or 'escape' velocity, the range of allowable entry angles for a prescribed peak deceleration is greatly increased, while the total heat

On the basis of strip theory neglecting induced downwash, an analysis has been made to obtain the geometric and aerodynamic characteristics of a number of flexible wings. The wings have leading edges which lie in a plane and utilize a trailing-edge cable which can have curvatures in both horizontal and vertical planes. Analytical solutions have been found for wings with leading edges of different shape which satisfy both the equation of static equilibrium for the trailing-edge cable as well as flexible air-foil theory for the strips. The wings are designed for a specific design angle of attack with a value of the chordwise tension parameter chosen to avoid camber flutter. A number of calculative cases are presented to show how the wing characteristics vary with three basic parameters used in the theory. An exploratory attempt to include induced downwash in the calculations using Prandtl swept lifting line was not successful because of singularities in the induced downwash. A combination of the Weissinger and Prandtl methods was partially successful but of limited accuracy. Further work is desirable to improve the accuracy before publishing the method. Further work is also required to investigate off-design characteristics. (Author)

AD-606 062 Div. 9, 1, 30, 31
OTS Prices: HC $6.00/MF $1.25

RAND Corp., Santa Monica, Calif.
NUMERICAL METHODS AND PROGRAM DESCRIPTION FOR THE INVERSE PROBLEM OF LINEARIZED, FULLY-CAVITATING HYDROFOIL THEORY,
by R. S. Grote. Sep 64, 212p RM-3563-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Programming (Computers), Hydrodynamics), (*Hydrofoils, Cavitation), (*Cavitation, Hydrofoils), Numerical methods and procedures, Compilers, Hydrodynamic configurations, Planning surfaces, Marine engineering.

This Memorandum documents the numerical methods used in and the computer program written for a recent study of fully-cavitating hydrofoils, as reported in a companion Memorandum (RM-3566-PR). The computer routines have been devised to calculate the profile shapes for two design methods and an off-design consideration of the problem. The present report briefly discusses each of the three methods, and proceeds to detailed presentations of the corresponding subroutines. The three methods encompass the cases of shockless-entry, nose-singularity, and the off-design calculations; their respective subroutines are entitled SECT3, SECT4, and SECT5. Various subsidiary subprograms are presented, together with a complete program listing. The program is written in FORTRAN II for the IBM 7090. An index to the subroutines and subprograms as discussed in the text and as presented in the listing (which is contained in the appendix) is provided. (Author)

AD-606 071 Div. 9
OTS Prices: HC $3.00/MF $0.75

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
DETERMINATION OF THE EFFECTS OF CHEMICAL AND VIBRATIONAL RELAXATION ON AN INVISCID HYPERSONIC FLOW FIELD,
by A. D. Wood, J. F. Springfield, and A. J. Pallone.
22 Jan 64, 80p RAD-TM-63-88
Contract AF04 694 239 Task 3.1

Unclassified report

Descriptors: (*Hypersonic flow, Numerical analysis), Gas flow, Vibration, Frozen equilibrium flow, Atmosphere entry, Temperature, Equations, Blunt bodies, Chemical properties.

The conservation equations for an inviscid, nonconducting fluid with chemical and vibrational relaxation are put into characteristic form for the determination of hypersonic flow fields. Application of the analysis to the simpler case of vibrational equilibrium is also discussed. The pressure and flow angle are calculated by local application of these relations, assuming proper values of the speed of sound based on the local composition of the relaxing gas. A coupled nonequilibrium calculation is carried out simultaneously along the streamline characteristic in which the rate equations for individual species production and vibrational relaxation, together with the energy equation, are used to obtain translational and vibrational temperatures and species concentrations, thereby completely determining the state of the gas. Results at typical entry conditions in the Earth's atmosphere are presented for pointed bodies with and without vibrational equilibrium and for blunted bodies with vibrational equilibrium. Comparisons are made with results from frozen and equilibrium analyses. The effects of both chemical and vibrational relaxation, and variation of nose bluntness, on the downstream composition of the gas are shown to be appreciable. (Author)

AD-606 072 Div. 9, 12
OTS Prices: HC $3.00/MF $0.75

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
NONEQUILIBRIUM WAKES WITH LAMINAR AND TURBULENT TRANSPORT,
by Hwaachii Lien, John I. Erdos, and Adrian J. Pallone.
22 Jan 64, 60p RAD-TM-63-87
Contract AF04 694 239, Task 3.1

Unclassified report

A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Reentry vehicles, Wake), (*Wake, Aerodynamic characteristics), Atmosphere entry, Thermodynamics, Transport properties, Laminar flow, Turbulence, Electron density, Energy, Mathematical analysis, Momentum.

The problem of the wake of a reentry vehicle is briefly reviewed, and an analysis is formulated for the solution of the nonsimilar, nonequilibrium viscous flow equations with laminar and turbulent transport. The air is treated as a mixture of eight components (N2, N, O2, O, NO, NO+, e-, and O2(-) in which the vibrational and electronic excitation modes are assumed in equilibrium with the translational mode. For the calculation of the rate of formation of each species, the reaction rates based on the most recent measurements are employed. Numerical results are presented for the wake of a 15-foot, 8-degree (half-angle) cone at 22,000 ft/sec, for altitudes of 150,000 feet and 115,000 feet. Based on the results of a recent correlation of wake transition data, instantaneous transition from laminar to turbulent flow is assumed to occur 250 feet from the cone vertex at 150,000 feet altitude, and 50 feet from the vertex at 115,000 feet altitude. The nonequilibrium effects are found to be appreciable at both altitudes particularly with respect to electron concentration. In the region where the temperature drops below 800K, the effect of three-body molecular attachment is found to be predominant. (Author)

AD-606 074 Div. 9
OTS Prices: HC $2.00/MF $0.50

Polytechnic Inst. of Brooklyn, N. Y.
THE LAMINAR BOUNDARY LAYER WITH UNIFORM INJECTION,
by Paul A. Libby and Karl Chen. Jun 64, 40p
PIBAL-836

Descriptors: (*Axially symmetric flow, Supersonic flow), (*Supersonic flow, Axially symmetric flow), (*Numerical methods and procedures, Fluid mechanics), Sound, Velocity, Entropy, Shock waves, Fluid flow, Numerical analysis.

AD-606 022 Div. 9
OTS Prices: HC $2.00/MF $0.50

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
BOUNDARIES OF JETS FROM HIGHLY UNDER-EXPANDED NOZZLES WITH EXTERNAL FLOW,
by T. C. Adamson, Jr. and Howard Jew. 16 Feb 62, 26p Bendix BSC-29687, Bendix FS-62TN-1024
Contract AF04 694 26

Unclassified report

Descriptors: (*Jets, Boundary layer), (*Supersonic flow, Boundary layer), Nozzles, Fluid flow, Numerical analysis.

An approximation method for the calculation of the boundaries of supersonic jets is given in which the flow geometry, as well as the initial conditions, may be varied. When the nozzle exit to ambient pressure ratio is relatively small and the external stream and jet have the same ratio of specific heats, this method compares favorably in accuracy with the more difficult method of characteristics.

AD-606 031 Div. 9
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE PROBLEM OF A STREAMLINED PROFILE IN A NEAR-SONIC FLOW,
by A. F. Kryuchin. 15 Aug 57, 26p T-76
TT 64 71432

Unclassified report

Trans. from Prikladnaya Matematika i Mekhanika (USSR) 1954, v. 18.

Descriptors: (*Subsonic flow, Mathematical analysis), (*Wedges, Subsonic characteristics), Shock waves, Pressure, Gas flow, Boundary layer, Boundary value problems, Numerical methods and procedures, Equations.

A study was made of a steady near sonic flow of gas in the absence of friction and heat transfer. As an example, a streamlined wedge was studied with a detached shock wave with the assumption that the velocity of the stream slightly exceeds the velocity of sound at infinity and the wedge has a small included angle. As a result of numerical calculations, the distribution of pressure over the profile, the location and shape of the shock wave and the equations of the sonic line are found.

AD-606 038 Div. 9, 1, 15, 31
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
THE INVERSE PROBLEM OF THE LINEARIZED THEORY OF FULLY-CAVITATING HYDROFOILS,
by B. R. Parkin. Sep 64, 75p RM-3566-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Hydrofoils, Cavitation), (*Cavitation, Hydrofoils), Hydrodynamic configurations, Optimization, Numerical methods and procedures, Hydrodynamics, Marine engineering.

This report presents the basic theory and some numerical results on the inverse problem for fully-cavitating hydrofoils. The problem is treated by the two-dimensional linearized theory of steady cavity flows. The problem of optimum hydrodynamic design of cavitating blades or foils is explored and the conditions required to insure realistic cavity flows are examined. As a result of these considerations three methods for profile design are put forward. Two of these methods are treated numerically. It is found that once the pressure distribution has been prescribed, the shape of the profile depends upon the design cavitation number. The camber decreases as the cavitation number increases. This report does not discuss the numerical methods used in the study. They are given separate documentation in AD-606 062. (Author)

AD-606 050 Div. 9, 17
OTS Prices: HC $2.00/MF $0.50

Hydronautics, Inc., Laurel, Md.
MECHANICAL PROPERTIES OF METALS AND THEIR CAVITATION DAMAGE RESISTANCE,
by A. Thiruvengadam and Sophia Waring. Jun 64, 44p Hydro-TR-233-5
Contract Nonr3755 00 FBM, Proj. NR062 293

Unclassified report

Descriptors: (*Cavitation, Damage), (*Metals, Erosion), Hydrodynamics, Mechanical properties, Aluminum alloys, Iron, Castings, Molybdenum, Stainless steel, Deformation, Steel, Bronze, Strain (Mechanics), Tensile properties, Elasticity, Hardness, Wear resistance.

Detailed investigations with a magnetostriction apparatus were carried out to determine the cavitation damage resistance of eleven metals in distilled water at 80F. The cavitation damage resistance is defined as the reciprocal of the rate of volume loss for a given metal. Among the mechanical properties investigated (ultimate tensile strength, yield strength, ultimate elongation, Brinell hardness, modulus of elasticity and strain-energy), the most significant property which characterizes the energy absorbing capacity of the metals, under the repeated, indenting loads due to the energy of cavitation bubble collapse in the steady state zone, was found to be the fracture strain energy of the metals. The strain energy is defined as the area of the stress-strain diagram up to fracture. The correlation between the strain energy and the reciprocal of the rate of volume loss leads directly to the estimation of the intensity of cavitation damage; this intensity varies as the square of the displacement amplitude of the specimen. All these conclusions are limited to the steady state zone of damage. (Author)

AD-606 059 Div. 9, 1
OTS Prices: HC $2.00/MF $0.50

Vidya Div., Itek Corp., Palo Alto, Calif.
THEORETICAL AERODYNAMICS OF FLEXIBLE WINGS AT LOW SPEEDS. III, APPROXIMATE RESULTS FOR WINGS OF LARGE ASPECT RATIO,
by A. R. Kriebel and J. N. Nielsen. 1 Jul 64, 43p Vidya-146
Contract Nonr3728 00, Proj. 9064

Unclassified report

See also AD-601 848.

Descriptors: (*Flexible structures, Wings), (*Wings, Aspect ratio), (*Aspect ratio, Wings), Airfoils, Aerodynamic configurations, Aerodynamic characteristics, Subsonic characteristics, Numerical analysis, Data.

10. Fuels and Combustion

AD-605 202 Div. 10, 14
OTS Prices: HC $1.00/MF $0.5(

Keck (W. M.) Lab. of Engineering Materials, Calif. Inst. of Tech., Pasadena.
A RESEARCH PROGRAM ON SOLID PROPELLANT PHYSICAL BEHAVIOR.
Quarterly rept. no. 3, 1 May-30 Jul 64,
by M. L. Williams. Aug 64, 6p MATSCIT-PS-64-7
Contract AF04 611 9572

Unclassified report

See also AD-602 753.

Descriptors: (*Solid rocket propellants, Physical properties), Models (Simulations), Elastomers, Composite materials, Strain (Mechanics), Electric bridges, Polymers, Standards, Documentation.

Research progress in the following fields is summarized: standardized material characterization; behavior of polymeric and composite systems; data information facility.

AD-605 460 Div. 10, 27
OTS Prices: HC $6.00/MF $1.25

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COMBUSTION IN LIQUID-PROPELLANT ROCKET MOTORS,
by Yu. Kh. Shaulov and M. O. Lerner. 31 Jul 64, 248p
FTD MT64 272; TT 64 71309

Unclassified report

Edited machine trans. of mono. Gorenie v Zhidkostnykh Raketnykh Dvigatelyakh, Moscow, 1961, 194p.

Descriptors: (*Liquid rocket propellants, Combustion), (*Combustion, Rocket motors (Liquid propellant)), Reaction kinetics, Ignition, Flame propagation, Stability, Turbulence, Detonations, Nitrogen compounds, Oxides, Atomization, Evaporation, Ignition lag, Combustion chambers, Fuel systems, Simulation.

Contents: elements of kinetics of chemical reactions; homogeneous and heterogenous combustion; kinetics of chemical reactions in flame; Carburetion; steady-state regime of burning; instability of combustion process; simulation of process of burning.

AD-605 560 Div. 10, 4
OTS Prices: HC $3.00/MF $0.75

Little (Arthur D.) Inc., Cambridge, Mass.
RADIATION SCAVENGING OF ACETYLENE DISSOLVED IN LIQUID OXYGEN, PART 1. IN-PLACE CLEANING OF PIPING SYSTEMS, PART 2.
Final rept.
30 Dec 61, 72p ALI-C-62458-33
Contract AF04 647 475

Unclassified report

Descriptors: (*Liquefied gases, Purification), (*Liquid rocket propellants, Impurities), Hydrocarbons, Radiation chemistry, Radioactive isotopes, Cobalt, Cesium, Chemical analysis, Decomposition, Storage, Pipes, Cleaning, Fluorine, Halogenated hydrocarbons, Coolants, Fluorination, Oxygen.

Destroying acetylene dissolved in liquid oxygen by irradiation with gamma rays was investigated. It was found that 94-98% of the acetylene in a saturated solution of acetylene in oxygen was removed in 8 hours at a dose rate of 80,000 rads. On this basis calculations indicated that a 5 kilocurie source of Co(60) or a 7.8 kilocurie source of Cs(137) would prevent any build-up of acetylene in a 28,000-gallon tank for a 10-year period. The most effective means of removing or passivating hydrocarbon contaminants in missile handling systems were investigated. Various experimental methods--treatment with gaseous fluorine, fluorination in Freon solutions, electrochemical fluorination, and vapor phase degreasing with Freons--were investigated. It was concluded that vapor phase degreasing with Freons is the most promising means of cleaning a system, and a discussion is given of the various problems encountered in the use of this method. (Author)

AD-605 700 Div. 10, 27, 25
OTS Prices: HC $1.00/MF $0.50

Princeton Univ., N. J.
SOME RESEARCH PROBLEMS IN THE STEADY-STATE BURNING OF COMPOSITE SOLID PROPELLANTS.
Technical rept. no. 1,
by D. W. Blair, E. K. Bastress, C. E. Hermance, K. P. Hall, and M. Summerfield. 10 Mar.60, 17p AER-499
Contracts Nonr 1858 32, Nonr1858 25, Proj. NR098 038, ARPA Order 5 58, Task 7

Unclassified report

Paper presented at the Solid Propellant Rocket Research Conference, Princeton Univ., N. J., 28-29 Jan 1960.

Descriptors: (*Solid rocket propellants Burning rate), (*Burning rate, Solid rocket propellants), Composite materials, Heat transfer, Flame propagation, Ammonium compounds, Perchlorates, Solid rocket oxidizers, Solid rocket fuels, Rocket research, Particle size, Theory, Combustion.

This paper outlines a number of basic problems in the theory of steady-state combustion of solid propellants, particularly of the ammonium perchlorate composite type. It represents an extension of the earlier research at Princeton that led to a theoretical burning rate law for composite propellants that was based on the concept of granular diffusion flame. This paper is in the nature of a progress report in which the new experimental approaches are described, and some puzzling difficulties are analyzed. Specifically, the experiments deal with three topics; refinement of methods for measuring burning rate; the role of radiative energy transfer in the burning process; and the connection between oxidizer particle size and the b parameter in the above-mentioned theoretical burning rate law. (Author)

AD-605 712 Div. 10, 25
OTS Prices: HC $3.00/MF $0.75

Purdue Univ., Lafayette, Ind. School of Aeronautical and Engineering Sciences.
ON THE THERMOMECHANICAL ANALYSIS AND BEHAVIOR OF VISCOELASTIC MEDIA SUBJECTED TO CYCLIC LOADING,
by R. A. Schapery. Jan 64, 61p A and ES-64-3
Contract AF94 611 8539, Proj. 3480

Unclassified report

Supported by Lockheed Propulsion Co., Redlands, Calif.

Grant AF AFOSR1 63
AFOSR 64 1395

Unclassified report

Descriptors: (*Laminar boundary layer, Transport properties), (*Laminar flow, Two-dimensional flow), Injection, Compressible flow, Incompressible flow, Mathematical analysis, Velocity, Fluid mechanics, Hydrogen, Energy, Equations, Motion, Heat transfer, Transformations (Mathematics), Differential geometry, Series, Flames, Model tests.

The non-similar velocity distribution in a two-dimensional laminar boundary layer with uniform external stream and with either uniform suction or injection is obtained by a series expansion in terms of a mass transfer parameter. The results are compared with more accurate analyses and shown to be in good agreement for a range of values of this parameter. The solution for the velocity distribution is then employed for the calculation of the distributions of energy and element mass fraction when there are imposed requirements for energy and mass balance at the exposed surface of a porous plate with uniform injection. As one example of several possible applications of these solutions, there is computed the flow associated with the injection of hydrogen into an airstream according to the flame sheet model. (Author)

AD-606 133 Div. 9, 12, 30
OTS Prices: HC $3.00/MF $0.75

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
THE DEVELOPMENT OF A TEN-MEGAWATT MULTI-ARC AND ITS OPERATIONAL USE IN HYPERSONIC RE-ENTRY VEHICLE STUDIES,
by C. E. Bond, J. Cordero, H. A. Curtiss, and B. D. Henshall. 22 Feb 62, 90p RAD-TM-62-5
Contract AF04 647 685 Proj. WS133A

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Atmosphere entry, Simulation), (*Electric arcs, Design), (*Reentry vehicles, Test facilities), Wind tunnels, Ablation, Laminar flow, Turbulence, Gas flow, Heat transfer, Magnetic fields, Hypersonic flow, Aerodynamic characteristics, Models (Simulations), Thermodynamics, Stabilization, Performance (Engineering), Flight.

A description is presented of the development of the Avco 10-megawatt air arc and its application to several re-entry simulation techniques. Improvements in the performance of the multi-arc design including the use of magnetic field arc stabilization techniques are discussed. It is shown that the facility is ideally suited for laminar and turbulent re-entry ablation studies using both splash and pipe techniques. A discussion of the shrouded model technique and some applicable test results for 6-inch diameter hemispherical models are presented. The Mach 5 hyperthermal wind tunnel which was used for aerodynamic and thermodynamic experimental work is discussed together with some of the test results for advanced re-entry vehiches. The future development program for the 10-megawatt arc facility is also described briefly. (Author)

VAPORIZING AND ENDOTHERMIC FUELS FOR ADVANCED ENGINE APPLICATION. PART I. PRELIMINARY STUDIES OF CATALIZED REACTIONS AND THERMAL STABILITIES OF HYDROCARBON FUELS.
Rept. for Jun 63-Jun 64,
by A. C. Nixon, I. S. Bjorklund, R. D. Hawthorn, H. T. Henderson, and A. W. Ritchie. Sep 64, 185p
Contract AF33 657 11096, Proj. 3048, Task 304801
APL TDR64 100 P1

Unclassified report

Descriptors: (*Aviation fuels, Chemical reactions), (*Jet engine fuels, Stability), (*Hydrocarbons, Jet engine fuels), Thermochemistry, Pyrolysis, Alkenes, Aliphatic compounds, Cyclohexanes, Monocyclic compounds, Dehydrogenation, Catalysis, Contamination, Heat transfer coefficients, Storage, Fuel additives, Solvents, Hypersonic planes, Fuel systems, Models (Simulations).

Studies leading toward the development of specifications for heat sink fuels for hypersonic aircraft are reported. Consideration of the effect of design parameters on the conditions under which endothermic reactions can be carried out has led to the conclusion that space velocities of 50 or higher would be necessary due to volume limitations in high-speed aircraft. Rate considerations favor catalytic reactions. Preliminary studies of the dehydrogenation of propane to propene and methylcyclohexane to toluene were made, and dehydrocyclization of various paraffins attempted. Thermal stability studies include the modification of two types of cokers to minimize contamination possibilities and improve reproducibility. Fuels may be tested at temperatures up to at least 1000F. The thermal stabilities of samples of n-dodecane, toluene and methylcyclohexane decreased in the order named. A 25 gal/hr fuel system simulation test rig which will be used for determining heat transfer coefficients, heat sinks and product compositions has been designed. (Author)

AD-605 889 Div. 10, 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE QUESTION ABOUT MECHANISM OF INFLUENCE OF LIQUID LAYER DURING BURNING OF MIXED SYSTEMS,
by A. P. Glazkova. 28 May 64, 14p
FTD MT64 25; TT 64 71413

Unclassified report

Edited machine trans. of Zhurnal Fizicheskoi Khimii (USSR) 1963, v. 37, no. 5, p. 1119-1123.

Descriptors: (*Solid rocket fuels, Reaction kinetics), (*Perchlorates, Combustion), Ammonium compounds, Potassium compounds, Solid rocket oxidizers, Solid rocket propellant binders, Mixtures, USSR.

A study was made of the burning of mixtures on a base of perchlorates of ammonium and potassium with fusible and infusible fuel in range of pressures of 1 -- 350 atm. If while burning, one of the components of the mixture changes to the liquid state, then the mixture burns according to a mechanism similar to the mechanism of burning of individual explosive substances. A hypothesis is expressed about mechanism of influence of liquid layer during burning of mixture systems. (Author)

AD-605 939 Div. 10, 4
OTS Prices: HC $1.00/MF $0.50

Utah Univ., Salt Lake City.
STUDIES TO DETERMINE THE MECHANISM OF PRODUCTION AND REMOVAL OF ELECTRONS IN FLAMES.
Semi-annual rept. for 1 Mar-31 Aug 59,
by Nalin R. Mukherjee, Takayuki Fueno, Henry Eyring, and Taikyue Ree. 31 Aug 59, 10p
Contract AF04 647 177

Unclassified report

Descriptors: (*Hydrocarbons, Combustion), (*Flames, Ionization), (*Electrons, Flames), Fuels, Oxidizers, Chemical equilibrium, Thermochemistry, Air, Oxygen, Carbon dioxide, Carbon compounds, Monoxides, Free radicals.

Results are given of studies involving the calculation of equilibrium concentrations of positive ions and the mechanism of ion formation in hydrocarbon flames. Specific examples concern the combustion of propane or acetylene in air or oxygen.

AD-605 945 Div. 10, 27
OTS Prices: HC $1.00/MF $0.50

Lockheed Propulsion Co., Redlands, Calif.
THERMAL GRAIN STRUCTURAL ANALYSIS.
Program progress rept. no. 13, 1-31 Dec 62,
by J. W. Jones and J. E. Fitzgerald. 31 Dec 62, 20p
LPC-578-P-13
Contract AF04 611 8013

Unclassified report

Descriptors: (*Rocket propellant grains, Thermal stresses), Solid rocket propellants, Viscoelasticity, Thermal properties, Rocket motors (Solid propellant), Models (Simulations), Structures, Mathematical analysis.

Effort was concentrated on computer determination of stresses in thermally cycled propellant grains. Parametric thermal stress data for grains with varying dimensions subjected to step thermal conditioning and the results of rapid cooling tests of analogue motors are presented. (Author)

AD-605 966 Div. 10
OTS Prices: HC $4.00/MF $0.75

RAND Corp., Santa Monica, Calif.
PHYSICAL PROPERTIES AND THERMODYNAMIC FUNCTIONS OF FUELS, OXIDIZERS, AND PRODUCTS OF COMBUSTION. VOLUME II. OXIDIZERS.
Rept. for 1 Oct 47-15 Nov 48.
Feb 49, 103p RAND-R-129
Contract W33 038ac14105

Unclassified report

Subcontract to Battelle Memorial Inst., Columbus, Ohio.
Rept. on Project RAND.

Descriptors: (*Oxidizers, Physical properties), Liquid rocket oxidizers, Solid rocket oxidizers, Thermodynamics, Molecular properties, Melting, Freezing, Boiling, Sublimation, Density, Viscosity, Surface tension, Thermal expansion, Thermal conductivity, Dipole moments, Heat of fusion, Heat of formation, Equations of state, Compressive properties, Specific heat, Entropy, Tables.

The physical properties and thermodynamic functions of the following elements and compounds are tabulated: Boron trifluoride, bromine, bromine trifluoride, chlorine, chlorine trifluoride, fluorine, hydrogen peroxide, nitric acid, nitrogen dioxide, nitrogen trifluoride, oxygen, oxygen fluoride, ozone.

Descriptors: (*Solid rocket propellants, Viscoelasticity), (*Viscoelasticity, Analysis), Mechanical properties, Thermal properties, Loading (Mechanics), Shear stresses, Geometric forms, Stability, Heat transfer, Equations.

The interaction between heating and dynamic response of viscoelastic bodies with temperature-dependent properties is studied. Equations governing the thermomechanical response to sinusoidal loading are developed and shown to be equivalent to a set of two variational principles. Viscoelastic properties of a solid propellant are characterized and then used in numerical examples dealing with sinusoidal shear loading of slabs and cylinders. As the first problem, an approximate variational method is used to calculate one-dimensional transient and steady-state temperature distributions in a massless slab. An exact steady-state solution is obtained for the thermomechanical behavior of a slab with concentrated mass, and is then used to deduce the solution for a similarly loaded cylinder. Finally, the influence of distributed mass in a slab and cylinder is studied using variational principles. It is found that with or without inertia a large temperature rise may occur when the stress is above a certain critical value which depends on thermal and mechanical properties and geometry. Furthermore, the combination of temperature-dependent properties and inertia leads to dynamic jump instabilities that are similar to those existing in a nonlinear spring-mass system. (Author)

AD-605 729 Div. 10
OTS Prices: HC $3.00/MF $0.75

Utah Univ., Salt Lake City.
IGNITION AND COMBUSTION OF SOLID PROPELLANTS.
Technical rept. for 1 Oct 62-30 Sep 63,
by Rex C. Mitchell, John A. Keller, Alva D. Baer, and Norman W. Ryan. 30 Sep 63, 78p
Grant AF AFOSR40 63
AFOSR 64 1665

Unclassified report

Descriptors: (*Solid rocket propellants, Ignition), Combustion, Flame propagation, Gas flow, Catalysts, Ammonium compounds, Perchlorates, Carbon black, Graphite, Solid rocket propellant binders, Combustion products, Flames, Hydrocarbons, Oxygen, Rocket igniters.

The spreading rate of the flame zone on the surface of a solid propellant was studied by use of a rarefaction tube. Cold gas flow past the burning zone and across the unburned surface produced high flame spread velocities. The experimental data were interpreted and correlated in terms of two theoretically predicted but experimentally determined parameters. Data obtained by subjecting composite propellant surfaces to thermal radiation fluxes in the range of 2-13 cal/(sec) (sq cm) were adequately explained in terms of a simple ignition theory. A comparison of the ignition characteristics of several types of catalyzed, composite ammonium-based propellants and of propellant type materials formed by pressing AP and non-volatile carbon black or graphite indicated that, in the range of heat fluxes studied, ignition occurs by decomposition of AP followed by a reaction between the decomposition products and solid fuel binder. A proposed ignition system in which a diffusion flame of propane and oxygen is the energy source was studied in small scale tests. Heat fluxes high enough to produce rapid propellant ignition were obtained. (Author)

AD-605 735 Div. 10, 4
OTS Prices: HC $2.00/MF $0.50

Rocket Power, Inc., Pasadena, Calif.
STUDY OF ROCKET ENGINE EXHAUST PRODUCTS.
Quarterly rept. no. 12, 1 Mar-31 May 64,
by M. A. Greenbaum, R. E. Yates, J. A. Blaur, M. Arshadi, and H. C. Ko. 31 May 64, 24p
RPI-P QR-7414-12
Contract AF04 611 7414

Unclassified report

See also AD-600 280.

Descriptors: (*Rocket propellants, Combustion products), (*Exhaust gases, Thermochemistry), Beryllium compounds, Oxides, Hydroxides, Water vapor, Chemical equilibrium, Fluorine, Dissociation, Heat of reaction, Solid rocket propellants, Hybrid rocket propellants.

Results are presented of studies on vapor equilibria in the BeO-H2O system at elevated temperatures, and the dissociation energy of F2(g).

AD-605 817 Div. 10, 4
OTS Prices: HC $5.00/MF $1.00

Monsanto Research Corp., Everett, Mass.
RESEARCH ON THE MECHANISM OF THERMAL DECOMPOSITION OF HYDROCARBON FUELS.
Rept. for 15 Nov 62-15 Nov 63,
by Bela M. Fabuss, Alexander S. Borsanyi, Dennis A. Duncan, Ralph Kafesjian, and John O. Smith.
Aug 64, 155p
Contract AF33 657 8193, Proj. 3048, Task 304801
ASD TDR63 102 P2

Unclassified report

Descriptors: (*Aviation fuels, Pyrolysis), (*Hydrocarbons, Pyrolysis), Reaction kinetics, Impurities, Organic sulfur compounds, Molecular structure, Heat of activation, Particles, Pressure, Aliphatic compounds, Aromatic compounds.

The decomposition and particle formation of 28 naphthenic and 8 paraffinic hydrocarbons were studied. The decomposition was approximately a first-order kinetic process, although self-acceleration was observed with most monocyclic hydrocarbons and self-inhibition was observed for polycyclic hydrocarbons. Pressure increased the decomposition rate. A detailed study of the effects of organosulfur contaminants was made. These contaminants inhibited the cracking of naphthenes and straight-chain paraffins and accelerated the cracking of branched paraffins. An increase in contaminant concentration and an increase in the number of methyl substituent groups on a hydrocarbon increased this effect. Several binary hydrocarbon mixtures were cracked. The component hydrocarbons did not crack independently. Nevertheless, the decomposition rate of the mixture could be predicted assuming no mutual interference in decomposition. The micro-coker, a new small-scale device for studying decomposition and deposit formation in a flow system, was developed. (Author)

AD-605 840 Div. 10, 4, 27
OTS Prices: HC $5.00/MF $1.00

Shell Development Co., Emeryville, Calif.

12. Guided Missiles

AD-605 139 Div. 12, 8, 30
OTS Prices: HC $10.25/MF $3.00

Autonetics, Downey, Calif.
UTILITY TECHNICAL MANUAL, OPERATION AND SERVICE INSTRUCTIONS WS-133A. GUIDANCE AND CONTROL SUBSYSTEM TEST SET MODEL C-19A,
15 Jul 61, rev. 11 Aug 61, 724p EM-2077
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Checkout procedures), (*Guidance, Checkout equipment), (*Checkout equipment, Instruction manuals), Test equipment (Electronics), Test methods, Control systems, Computers, Programming (Computers), Electronic equipment, Circuits, Wiring diagrams, Maintenance, Measurement, Operation, Calibration, Compilers, Punched tape, Signal generators, Inertial guidance.

This manual contains operation and service instructions for C-19A Guidance and Control Subsystem Test Set. The C-19A Test Set is used to check out the NP10 Guidance and Control System. As commanded by a preprogrammed tape, the C-19A test set controls application of power, makes all the measurements, and generates all the control signals needed to automatically test the major operational functions of the flight control electronics sections of all three stages of the WS-133A Guidance and Control System; the guidance compartment section (including the computer), and the angular accelerometers. In addition, the C-19A test set continuously monitors the temperatures in the guidance and control packages, checks hydraulic system pressures, and shuts down the section being tested when conditions so warrant.

AD-605 156 Div. 12, 9
OTS Prices: HC $3.00/MF $0.75

Air Force Flight Dynamics Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
FURTHER INVESTIGATION OF ELASTIC MODE EFFECTS ON CLOSED-LOOP STABILITY OF A WINGED BOOSTER.
Final rept. for Dec 62-Mar 63,
by Robert L. Swain. Apr 63, 68p ASRMCM-TM-63-1
Proj. 8219, Task 821901
N63 18155
Unclassified report

Descriptors: (*Booster motors, Stability), (*Elasticity, Dynamics), Launch vehicles (Aerospace), Wings, Aerodynamic control surfaces, Feedback, Flight control systems, Aerodynamics, Control.

This report is devoted to a closed-loop analysis of the dynamic interaction of elastic and rigid body modes for a large booster in the ORION class. A variety of possible first and second elastic mode shapes is assumed along with three different sensor locations. Closed-loop dynamics are determined for all combinations of these conditions and for a wide variation in autopilot, actuator, and rate gyro gains. The interaction is shown to be very severe on both the short-period and elastic modes. For all cases considered, regardless of the gains used, the real roots corresponding to the first-order actuator and rate gyro time constants were positive, indicating instabilities. It is also shown analytically that there is no combination of actuator, autopilot, and gyro gains which would stabilize the stated system. In addition, the short-period characteristics are very insensitive to orders-of-magnitude variations in system gains. These surprising results mean that conventional sensing and feedback control with single actuation would not be suitable for this vehicle. (Author)

AD-605 198 Div. 12, 9
OTS Prices: HC $2.00/MF $0.50

Boeing Co., Seattle, Wash.
GAS DYNAMICS TEST PLAN, WS-133B MINUTEMAN,
by R. H. Miller. 10 Aug 62, 30p D2-30017
Contracts AF04 647 289
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Research program administration), (*Aerodynamic characteristics, Guided missiles (Surface-to-surface)), Gas flow, Ablation, Guided missile models, Model tests, Silos, Wind tunnels, Pressure, Thermal insulation, Nozzles, Test equipment, Configuration, Air Force, Dynamics, Design, Test methods.

This document outlines the gas dynamics tests to be conducted in support of the WS-133B Minuteman Program. These tests will provide support data for the design documents referenced in 'Gas Dynamic Criteria-WS-133B'. Test requirements, test purposes, facilities, model requirements, test run schedules, and instrumentation are discussed. (Author)

AD-605 208 Div. 12, 18, 27
OTS Prices: HC $1.00/MF $0.50

Douglas Aircraft Co., Inc., Santa Monica, Calif.
'ITHACUS' - A NEW CONCEPT OF INTER-CONTINENTAL BALLISTIC TRANSPORT (ICBT),
by Philip Bono and George C. Goldbaum. Rev. May 64,
20p DAC-EP-1868
Unclassified report

Presented at AIAA Annual Meeting (1st), Washington, D. C., 29 Jun-2 Jul 64. AIAA Paper no. 64-280.

Descriptors: (*Manned spacecraft, Recoverable booster motors), (*Recoverable boaster motors, Manned spacecraft), Launch vehicles (Aerospace), Rocket motors (Liquid propellant), Plug nozzles, Soft landing, Re-entry vehicles, Payload, Design, Feasibility studies, Mission profiles, Logistics.

This paper describes a concept for a rocket-powered troop transport which may potentially evolve from the reusable booster of tomorrow. The VTOL rocket concept is based on the premise that the initial reusable booster, sized for a payload of approximately 800,000 pounds-to-orbit, is also designed for land recovery.

AD-605 209 Div. 12, 18, 27
OTS Prices: HC $2.00/MF $0.50

Douglas Aircraft Co., Inc., Santa Monica, Calif.
THE REUSABLE BOOSTER FOR LUNAR LOGISTICS AND PLANETARY EXPLORATION,
by Phil Bono, J. L. Woodworth, and G. A. Ursini.
1964, 32p DAC-EP-1887
Unclassified report

Presented to the International Astronautical Federation (I.A.F.) Congress (15th), 7-12 Sep 64, Warsaw, Poland.

Descriptors: (*Recoverable booster motors, Lunar craft), (*Lunar craft, Logistics), (*Manned spacecraft, Recoverable booster motors), Rendezvous spacecraft, Parking orbit trajectories, Plug nozzles, Soft landings, Mission profiles, Rocket motors (Liquid propellant), Combustion chambers, Launch vehicles (Aerospace), Lunar trajectories, Payload, Interplanetary trajectories, Space stations, Extraterrestrial bases, Re-entry vehicles, Feasibility studies, Design.

AD-605 967 Div. 10
OTS Prices: HC $7.00/MF $1.50

RAND Corp., Santa Monica, Calif.
PHYSICAL PROPERTIES AND THERMODYNAMIC FUNCTIONS OF FUELS, OXIDIZERS, AND PRODUCTS OF COMBUSTION. VOLUME I. FUELS.
Rept. for 1 Oct 46-15 Aug 48.
Jan 49, 315p RAND-R-127
Contract W33 038ac14105

Unclassified report

Subcontract to Battelle Memorial Inst., Columbus, Ohio.
Rept. on Project RAND.

Descriptors: (*Rocket propellants, Physical properties), Solid rocket fuels, Liquid rocket fuels, Thermodynamics, Molecular properties, Melting, Freezing, Boiling, Sublimation, Density, Vapor pressure, Viscosity, Surface tension, Thermal expansion, Thermal conductivity, Dipole moments, Heat of fusion, Heat of formation, Equations of state, Compressive properties, Specific heat, Entropy, Tables.

The physical properties and thermodynamic functions of the following elements and compounds are tabulated: acetone, acetylene, aluminum, aluminum borohydride, ammonia, aniline, carbon disulfide, carbon monoxide, cyanogen, cyclopropane, diborane, ethane, ethanol, ethylene, ethyl ether, formaldehyde, hydrazine, hydrogen, lithium, lithium hydride, magnesium, methane, methanol, methylamine, methyl nitrate, monoethylaniline, nitroethane, nitromethane, n-octane, pentaborane, sodium, tetranitromethane, triborinetriamine (borazole), trioxane.

AD-606 045 Div. 10, 30
OTS Prices: HC $3.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
A LOW SPEED WIND TUNNEL FOR MEASURING THE EFFECT OF WIND ON BUOYANT DIFFUSION FLAMES,
by J. Reed Welker and C. M. Sliepcevich. 15 Sep 64,
55p OURI-TM-1454-4-1
Contract DA18 035AMC116A, Proj. 1454

Unclassified report

Descriptors: (*Flame propagation, Wind), (*Wind tunnels, Flames), Fuel consumption, Dynamics, Diffusion, Combustion, Heat transfer, Drag.

The purpose of the equipment described in this paper is to provide the environment necessary to study the behavior of flames from liquid pools under the influence of wind. The equipment includes a wind tunnel with supporting blower, appropriate calming section, and observation and control room; the burner trays; and a fuel delivery system. The design of the tunnel and equipment is based on information available in the literature.

AD-606 058 Div. 10
OTS Prices: HC $1.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
REDUCTION OF ALUMINUM OXIDE BY PROPELLANT COMBUSTION GASES AT HIGH TEMPERATURES,
S. G. Gibbins and B. Siegel. 1 Sep 64, 14p
TDR-269(4210-10)-7
Contract AF04(695)-269
SSD TDR64 160

Unclassified report

Descriptors: (*Solid rocket propellants, Reduction (Chemistry)), (*Aluminum compounds, Oxides), (*Combustion products, Solid rocket propellants), Gases, Graphite, High-temperature research, Guided missiles.

The effect of hydrogen on crystalline Al2O3 was studied at pressures ranging from 2 mm to approximately atmospheric at 1700-1800C. At the higher pressures there was no observable reduction of the alumina in the presence of hydrogen alone. However, when graphite was also present, aluminum carbide was formed at an appreciable rate. The formation of the carbide is explained on the basis of a reaction between graphite and H2 to form methane, which reduces the alumina. At very low pressures hydrogen alone did reduce alumina appreciably, but the product was not identified. Alumina was also reduced at a small but observable rate by carbon monoxide at 1700C and a pressure of approx. 0.5 atm. The implications of these phenomena for propulsion are discussed with reference to their effects on propellant performance and missile detection. (Author)

11. Ground Transportation Equipment

No Entries

Development Command, Inglewood, Calif.
A DIFFERENT APPROACH TO GROUND EQUIPMENT DEVELOPMENT,
by Theodore O. Wright. 1961, 10p

Unclassified report

Descriptors: (*Guided missiles, Checkout equipment), (*Checkout equipment, Systems engineering), (*Ground support equipment, Systems engineering), Weapon systems, Checkout procedures, Management planning, Management engineering, Standardization, Maintenance, Reliability, Design.

Two major types of ground equipment used in the ballistic missile programs, Ground Operating Equipment and Ground Support Equipment, are identified. The importance of their distinction and their development into our integrated weapon system are covered.

AD-605 244 Div. 12, 5, 16, 29
OTS Prices: HC $5.00/MF $1.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
FLIGHTS INTO SPACE,
by Yu. N. Sushkov. 22 Jun 64, 156p
FTD MT64 227; TT 64 71296

Unclassified report

Edited machine trans. of mono. Polety v Kosmos, Moscow, 1963, 138p.

Descriptors: (*Space flight, USSR), Gravity, Spacecraft, Rocket motors, Solid rocket fuels, Liquid rocket fuels, Weightlessness, Radiation hazards, Meteors, Space medicine, Astronauts, Training, Food, Trajectories, Control systems, Safety, Space communication systems, Space environmental conditions, Pressure suits, Life support, Moon, Satellites (Artifical).

The properties of gravity and the possible ways of overcoming it, the principles of work and installation of spaceships and rocket engines operating on solid and liquid fuel, and the energetics of rocket flight are discussed. Statements are made concerning G-forces, weightlessness, hypodynamics, meteor and radiation danger and means of protection from them. The reader will recognize how space flights are ensured in the medico-biological respect, how are astronauts trained, what is space food, and how to observe the rules of hygiene in flight. Also expounded is a series of questions insufficiently illuminated in the popular press. How to calculate trajectory and control of a spaceship. How does a ship return from space to Earth or how will it land on another planet. What is the reliability of the spaceship, carrier rocket and system of control. How is space radio- and telecommunication carried out. How is safety of flight ensured. What is the role of automatic machines in scientific research and in supporting of normal conditions of vital activity of astronauts. What is the composition and air pressure and temperature rate in the cabin of the ship. How is the space pressure suit constructed. What is the contemporary state of the development of astronautics in the Soviet Union and the United States.

AD-605 297 Div. 12, 15
OTS Prices: HC $3.00/MF $0.75

Aerospace Corp., Los Angeles, Calif.
EQUATIONS OF MOTION FOR A GRAVITY-GRADIENT STABILIZED SATELLITE SUBJECT TO AMBIENT PERTURBING FORCES AND TORQUES,
by V. Chobotov. 1 May 64, 68p TDR-269(4540-70)-2
Contract AF04 695 269
SSD TDR64 114

Unclassified report

Descriptors: (*Satellites (Artificial), Stabilization systems), (*Astronautics, Mathematical analysis), (*Equations, Motion), Orbital trajectories, Geophysics, Magnetic fields, Solar radiation, Drag, Torque, Matrix algebra.

The three translational and three rotational equations of motion for a gravity-gradient stabilized satellite are derived. The effects of the earth oblateness, magnetic field, solar radiation, aerodynamic drag, and any control forces are included. The usefulness of vector, matrix, and dyadic notation for derivation of equations is demonstrated and the results reduced to scalar form wherever possible. (Author)

AD-605 308 Div. 12
OTS Prices: HC $1.00/MF $0.50

Aerojet-General Corp., Azusa, Calif.
ALLOWABLE MEASURED LATERAL CENTER-OF-GRAVITY OFFSET OF DRY ABLESTAR STAGE.
Special rept.
by L. D. DeGroot. Aug 62, 16p AGC-2251A, AGC-2251, suppl.

Unclassified report

Descriptors: (*Staging, Center of gravity), (*Center of gravity, Launch vehicles (Aerospace)), (*Guided missiles (Surface-to-surface), Center of gravity), Thrust vector control systems, Payload, Propulsion, Load distribution, Statistical analysis.

This document is a supplement to AGC Special Report 2251, 'Analysis of Lateral Center-of-Gravity Displacement in the Ablestar Stage.' This report considers the effect of the uncertainty in aligning the thrust chamber on the allowable measured center-of-gravity offset of the dry Ablestar Stage. This effect was not taken into account in Report 2251. The new results show that the allowable center-of-gravity offset is reduced approximately 20 percent. (Author)

AD-605 399 Div. 12, 9
OTS Prices: HC $3.00/MF $0.75

Brown Engineering Co., Inc., Huntsville, Ala.
ANALYSIS OF THE LAMINAR BASE FLOW REGION BEHIND SHARP RE-ENTRY BODIES,
by Gerald R. Guinn. Aug 64, 100p BrownEng-R-110
Contract DA01 021AMC85Z

Unclassified report

Descriptors: (*Laminar flow, Base flow), (*Base flow, Laminar flow), (*Reentry vehicles, Laminar flow), Atmosphere entry, Conical bodies, Shock waves, Gas flow, Models (Simulations), Numerical analysis, Tables, Graphics, Experimental data.

The laminar base flow analysis of Denison, King, and Baum at Electro-Optical Systems, Inc. was used to calculate the flow behind conical re-entry bodies. The method of Hansen was used to obtain the equilibrium properties of air and a perfect gas model was used to simulate the 'frozen' air properties. The two air models resulted in a difference in base recirculation volume by as much as 150% for a typical re-entry situation. (Author)

AD-605 477 Div. 12
OTS Prices: HC $6.00/MF $1.25

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J.
DESIGN, DEVELOPMENT AND FABRICATION OF

This paper presents a potential solution to the economic problem of lunar logistics transportation, through the repeated application of a typical reusable booster. To obtain a realistic appraisal of payload capability and weight, a hypothetical orbital booster, which is Earth-recovered on four landing legs, is adopted as a representative lunar cargo carrier. The paper describes how, through increased rendezvous operations in Earth orbit, the reusable booster can be applied to progressively larger lunar payload-delivery missions. The vehicle systems' aspects are investigated, with emphasis placed on the propulsion requirements. After presenting a number of speculative engine module configurations and identifying the major propulsive problem areas for a mission to orbit and return, the paper discusses the problems related to buildup of a hypothetical lunar base, supplied by the typical reusable booster.

AD-605 210 Div. 12, 18, 27
OTS Prices: HC $2.00/MF $0.50

Douglas Aircraft Co., Inc., Santa Monica, Calif.
ROMBUS - AN INTEGRATED SYSTEMS CONCEPT FOR A REUSABLE ORBITAL MODULE (BOOSTER AND UTILITY SHUTTLE),
by Philip Bono. 1963, 28p DAC-EP-1552
Unclassified report

Presented to the National Summer Meeting (1st) Sponsored by the American Institute of Aeronautics and Astronautics, Los Angeles, Calif. 18 Jun 63. AIAA Preprint no. 63-271.

Descriptors: (*Manned spacecraft, Recoverable booster motors), (*Recoverable booster motors, Manned spacecraft) (*Rendezvous spacecraft, Manned spacecraft), Launch vehicles (Aerospace), Re-entry vehicles, Soft landings, Parking orbit trajectories, Payload, Plug nozzles, Rocket motors (Liquid propellant), Space stations, Feasibility studies, Costs.

A conceptual design for a reusable surface-to-orbit manned cargo carrier which can deliver a payload of many hundreds of tons to a 175 nautical mile orbital altitude is defined. Recovery is accomplished by deployment of a subsonic drag device and terminal retro-thrust. Touch down on land is implemented by settling on four extensible legs, in a manner similar to the basic method which is being developed for landing on the moon. The vehicle is propelled by a conjectural altitude-compensating plug-nozzle engine which can be throttled for the landing maneuver. The paper tentatively concludes that the assumed high-chamber pressure LO2/LH2 engines of altitude-compensating design (with high expansion ratios) would present a dramatic improvement over conventional engines, in achieving the desired objectives of minimum vehicle growth factors, and minimum program costs. It appears economically justified that the next generation of large launch vehicles should be reusable, single-stage-to-orbit, and developed to incorporate maximum mission flexibility.

AD-605 211 Div. 12, 18, 27
OTS Prices: HC $2.00/MF $0.50

Douglas Aircraft Co., Inc., Santa Monica, Calif.
'PEGASUS' - A DESIGN CONCEPT FOR A V.I.P. ORBITAL/GLOBAL ROCKET TRANSPORT,
by Phil Bono, G. C. Goldbaum, and R. M. Wood.
7 Oct 64, 28p DAC-EP-1980
Unclassified report

Presented to S.A.E. National Aeronautic and Space Meeting, Los Angeles, Calif.

Descriptors: (*Recoverable booster motors, Manned spacecraft), (*Manned spacecraft, Recoverable booster motors), Launch vehicles (Aerospace), Payload, Plug nozzles, Rocket motors (Liquid propellant), Soft landings, Reentry vehicles, Mission profiles, Logistics, Design, Feasibility studies, Thermodynamics.

This paper describes the results of a study to determine operational and economic aspects of a new class of carrier for high-income passengers and high-priority cargo evolved from the reusable booster of tomorrow. Evolution of the hypothetical transport system, termed Pegasus, is based on the premise that after vehicle survival of atmospheric penetration has become commonplace, a reusable booster of the Saturn V payload class (100 tons to orbit) may be developed and later adapted for ballistic surface-to-surface payload delivery.

AD-605 212 Div. 12, 18, 27
OTS Prices: HC $1.00/MF $0.50

Douglas Aircraft Co., Inc., Santa Monica, Calif.
THE INFLUENCE OF UNCONVENTIONAL STRUCTURES AND MATERIALS ON BOOSTER REUSABILITY,
by Phil Bono, C. H. Printz, and G. E. Kahre.
3 Apr 64, 24p DAC-EP-1829
Unclassified report

Presented to the Annual Structures and Materials Conference (5th) Sponsored by The American Institute of Aeronautics and Astronautics, Palm Springs, Calif., 1-3 Apr 64.

Descriptors: (*Recoverable booster motors, Economics), (*Manned spacecraft, Design), Structural parts, Materials, Payload, Costs, Mechanical properties, Thermodynamics, Weight, Launch vehicles (Aerospace), Reentry vehicles, Propellant tanks, Plug nozzles, Cooling, Rocket motors (Liquid propellant), Feasibility studies.

This paper presents a conceptual definition for the structure of a hypothetical re-useable booster, which is optimized for minimum gross weight. The paper defines the environment on the structural configuration from reflected noise prior to lift-off, from flight loads during ascent, from meteorite considerations while in orbit, from re-entry heating during atmospheric penetration, and from impact loads upon touch-down after recovery. A unique method for cooling the re-entry structure is described, as is a passive method of withstanding water-impact loads resulting from ocean recovery. An integrated approach to multiple-purpose structures is discussed. An economic analysis is presented to substantiate the conclusion that flight structures comprise the major portion of launch vehicle operational costs.

AD-605 227 Div. 12, 15
OTS Prices: HC $1.00/MF $0.50

Air Force Ballistic Missile Div., Air Research and Development Command, Inglewood, Calif.
A MATHEMATICAL APPROACH FOR OPTIMUM CHECK-OUT DESIGN CRITERIA,
by Theodore O. Wright. 1961, 20p
Unclassified report

Descriptors: (*Checkout procedures, Optimization), (*Aerospace craft, Checkout procedures), (*Systems engineering, Aeronautics), Mathematical models, Set theory, Checkout equipment, Design.

AD-605 228 Div. 12
OTS Prices: HC $1.00/MF $0.50

Air Force Ballistic Missile Div., Air Research and

out of the plane of the moon. This three-dimensional analysis indicates that the velocity accuracy requirements increase sharply as the plane of the trajectory is inclined with respect to the plane of the moon, and also that the accuracy requirements vary greatly for different launch times, both for given times of the day and given days of the month. Methods for analytically determining appropriate launch times and azimuths are also given. Section 3 is a brief application of the ideas presented above to some of the special problems posed by attempting to establish a lunar satellite.

AD-605 610 Div. 12
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
UNIVERSAL GRAVITY TURN CURVES,
by Glen Culler and Burton D. Fried. 1 Nov 55, 50p
RW(ARL)-5-2

Unclassified report

Descriptors: (*Trajectories, Astronautics), (*Astronautics, Trajectories), (*Gravity, Astronautics), Guided missiles, Satellites (Artificial), Angle of attack, Equations, Motion, Graphics, Ballistics.

The powered flight trajectories of long range missiles, satellites, etc., may involve an 'atmospheric' portion, in which aerodynamic forces and moments are of importance, and a 'post-atmospheric' section, in which these effects are negligible. During this latter part of the flight, the trajectory to be followed is quite simple. A trajectory which can be used for this part is the 'gravity turn' sometimes referred to as a 'zero angle of attack' or 'no-lift' trajectory. It consists in keeping the thrust always parallel to velocity, starting from some non-zero, non-vertical, initial velocity, v sub 0. This report describes a method which has been used to obtain such universal solutions for gravity turns which begin very shortly after the launching time. The physical problem is presented, and an analytical solution for the case of constant thrust-weight ratio is given. A method of numerical solution for the case of constant thrust and mass flow rate is discussed and universal curves for this problem are presented.

AD-605 635 Div. 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
SIMULTANEOUS EFFECT OF DRAG AND OBLATENESS,
by W. T. Kyner. 19 Aug 59, 16p
STL-TR-59-0000-00817

Unclassified report

Descriptors: (*Satellites (Artificial), Motion), (*Elliptical orbit trajectories, Numerical analysis), Drag, Earth, Geometric forms, Orbital trajectories, Momentum, Differential equations.

The purpose of the report is to derive a convenient set of differential equations for the study of the simultaneous effect of the earth's oblateness and of atmospheric drag on the motion of an aritficial satellite. An immediate conclusion is that drag tends to increase the effect of oblateness. Rough numerical tests indicate that this may be expected for orbits with perigees of around one hundred nautical miles, e.g. Explorer III. An approximate formula for the magnitude of the angular momentum as a function of the latitude is derived. It is used to determine the eccentricity, semi-major axis, and inclination of the plane of the instantaneous ellipse of the orbit. (Author)

AD-605 670 Div. 12, 27
OTS Prices: HC $1.00/MF $0.50

Astrosystems International, Inc., Caldwell, N. J.
HIGH ALTITUDE PLUME SIMULATION.
Progress rept. no. 4, 10 Feb-10 Mar 62,
10 Mar 62, 24p Astrosys-TR 61052-P4
Contract AF04 695 33

Unclassified report

Descriptors: (*Rocket motors, Exhaust gases), (*Exhaust gases, Simulation), High altitude, Instrumentation, Control systems, Vacuum apparatus, Cooling, Exhaust flames, Costs, Engineering personnel, Technicians.

The project effort can be reduced to four major areas of consideration for accomplishment: (1) altitude (vacuum) facilities, (2) rocket engine, (3) radiometric instrumentation, and (4) system integration. This report considers each of the above four areas separately and delineates what progress has been made.

AD-605 710 Div. 12
OTS Prices: HC $1.00/MF $0.50

Naval Weapons Lab., Dahlgren, Va.
PERTURBATION IN ECCENTRICITY IN BROUWER-LYDDANE THEORY.
Technical memo.,
by C. J. Cohen. Mar 64, 9p
NWL K7 64

Unclassified report

Descriptors: (*Elliptical orbit trajectories, Perturbation theory), (*Satellites (Artificial), Orbital trajectories), Harmonic analysis, Astronomical geodesics.

The Brouwer theory for the orbit of a near earth satellite requires that as the eccentricity tends to zero, the long period perturbation in eccentricity tends to a finite value dependent on the ratio of the odd degree harmonic coefficients to the second degree harmonic coefficient. With the Lyddane correction to the Brouwer theory, however, it is found that the long period perturbation in eccentricity tends to zero. For satellite 1963 22A, the Brouwer formula is in error by only 12 per cent. (Author)

AD-605 737 Div. 12, 2
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE SYMPOSIUM ON THE USE OF SPACE VEHICLES AT THE FALL 1958 URSI MEETING,
by W. C. Hoffman. 25 Nov 58, 26p P-1557

Unclassified report

Descriptors: (*Satellites (Artificial), Instrumentation), (*Ionosphere, Scientific satellites), Space probes, Radio transmission, Geophysics, Ionospheric propagation, Radio astronomy, Symposia.

AD-605 751 Div. 12, 2, 25, 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SCIENTIFIC USES FOR A SATELLITE VEHICLE,
by R. R. Carhart. 12 Feb 54, 36p RM-1194

Unclassified report

ULTRA HIGH STRENGTH SOLID PROPELLANT ROCKET MOTOR CASES.
Final technical rept.,
by E. P. Gilewicz. Aug 64, 262p WAD-R-407F
Contract AF04 611 9064
RPL TDR64 114

Unclassified report

Descriptors: (*Rocket cases, Rocket motors (Solid propellant)), Design, Production, Tests, Metals, Mechanical properties, Maraging steels.

AD-605 486 Div. 12
OTS Prices: HC $4.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
FEASIBILITY OF A TRACTOR TYPE SELF-MANEUVERING UNIT.
Master's thesis,
by John S. Heyde Jr. Aug 64, 101p
AFIT GA/Phys/64 4

Unclassified report

Descriptors: (*Spacecraft, Maneuverability), Manned spacecraft, Flight control systems, Astronautics, Feasibility studies, Human engineering, Flight simulators.

A small, unstablized, tractor type, self-maneuvering unit (SMU) is not considered a satisfactory vehicle for extravehicular travel in space. A pendulum analogy of flight does not prove a satisfactory method of analyzing the space flight characteristics of an unstablized system because of the pilots lack of a good reference system and thrust direction indicator. A space flight simulator study reveals that using pitching and yawing thrust to control the main thrust vector of a stablized SMU, the rendezvous with a target over distances up to five hundred feet is a relatively simple maneuver. No reverse thrust is necessary to reduce terminal velocity because of the small velocity build-up in flight. However, when the conditions of off-center thrust are simulated by providing a constant roll rate the percentage of hits on the target is reduced from a mean value of 90% to 17%; moreover, the terminal velocity increases to the point where retro-thrust is needed to provide a safe landing. The tractor type SMU is a very risky method of transportation which requires a very skilled operator to obtain even minimum success. (Author)

AD-605 561 Div. 12, 30
OTS Prices: HC $3.00/MF $0.75

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
COOLING SYSTEM FOR MODEL NOSE CONES IN THE E-2 HYPERSONIC WIND TUNNEL, GAS DYNAMICS FACILITY, AEDC.
Technical information series,
by V. DiCristina. 14 Oct 57, 66p R57SD426

Unclassified report

Descriptors: (*Nose cones, Cooling), Coolants, Liquefield gases, Nitrogen, Halogenated hydrocarbons, Liquid cooled, Boiling, Water, Aerodynamic heating, Heat transfer coefficients, Heat transfer, Thermodynamics, Hypersonic wind tunnels.

Three systems for cooling a model nose cone in steady state heat transfer were evaluated. These were: liquid nitrogen, liquid Freon 22, and boiling water. As a result of the design study, the boiling water system was found to be the most economical, efficient, and stable system to use. It was predicted that this system would assure a constant inner wall temperature. Tests conducted on a heated model using boiling water as the coolant are presented. These tests substantiate the predictions made and serve also to demonstrate the effectiveness and simplicity of such a system. (Author)

AD-605 565 Div. 12, 2
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE EFFECT OF THE OBLATENESS OF THE EARTH ON THE TRAJECTORY OF A BALLISTIC MISSILE,
by John Green. 1963 , 18p STL-GM-TM-0165-00340

Unclassified report

Descriptors: (*Guided missile trajectories, Perturbation theory), (*Perturbation theory, Guided missile trajectories), Guided missiles (Surface-To-Surface), Trajectories, Ballistics, Potential theory, Trigonometry, Equations, Motion, Earth, Geophysics.

AD-605 575 Div. 12, 27
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge Corp., Los Angeles, Calif.
ON THE POWERED FLIGHT TRAJECTORY OF AN EARTH SATELLITE,
by Burton D. Fried. 13 Mar 56, 12p RW(ARL)-6-6

Unclassified report

Descriptors: (*Satellites (Artificial), Ascent trajectories), (*Ascent trajectories, Satellites (Artificial)), Booster motors, Trajectories, Optimization.

The actual choice of a powered flight trajectory depends upon details of booster design and upon the particular orbit selected, the latter being determined by instrumentation and data requirements. Independent of these considerations, however, it is of interest to ask what type of trajectory will be optimal from the standpoint of missile efficiency. The approach used assumes that the characteristics of the booster, i.e., its thrust and mass as functions of time, are specified. The problem is then to determine what powered flight trajectory will put the satellite into an orbit of maximum altitude.

AD-605 576 Div. 12, 2
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
ANALYTICAL AND NUMERICAL STUDIES OF THREE-DIMENSIONAL TRAJECTORIES TO THE MOON,
by A. B. Mickelwait and R. C. Booton, Jr. 10 Nov 58, 67p STL-GM-TR-0165-00508

Unclassified report

Rept. on Trajectory Studies of Ballistic Missiles, Satellites and Space Vehicles.

Descriptors: (*Lunar trajectories, Numerical analysis), (*N-body problem, Lunar trajectories), Spacecraft, Launch vehicles (Aerospace), Guidance, Lunar probes, Space propulsion, Moon, Trajectories, Graphics.

The purpose of this paper is to present theoretical calculations of lunar trajectories from the point of view of the guidance problem. Section 1 contains the conventional two-dimensional analysis with the usual decomposition of the actual N-body problem, the earth, moon, vehicle, sun, etc., into the more tractable succession of two-body problems. The analytic statement of the required accuracy to impact on the moon's surface is then determined and compared with the actual accuracy needed. Section 2 examines the effect on the necessary guidance accuracy of launching

Descriptors: (*Guided missiles, Gust loads), (*Gust loads, Guided missiles), Aerodynamic loading, Aerodynamic characteristics, Atmospheric motion, Control systems, Design, Revolution, Slender bodies, Gusts.

The report concerns the aerodynamic force acting on a stationary missile in a uniform flow when it encounters a sharp-edged gust. The result is probably useful for preliminary design. Its use generally implies a more severe loading condition for the control servo design than that given by the quasi-steady assumption. But as far as the maximum bending moment in the missile body is concerned, the transient analysis gives practically the same result as the quasi-steady assumption. (Author)

AD-605 984 Div. 12, 7, 25
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
LOW PRESSURE ELECTRICAL DISCHARGE STUDIES,
by W. H. Krebs and A. C. Reed. 17 Dec 59, 78p
STL/TR-59-0000-09931
Contract AF04 647 309

Unclassified report

Descriptors: (*Electric discharges, High altitude), (*Guided missile components, Malfunctions), Air, Water vapor, Sparks, Secondary emission, Electrical equipment, Low-pressure research, Electrodes, Electrical properties, Geometric forms, Encapsulation, Casting, Reviews, Bibliographies.

The report concerns electrical breakdown of air at low pressures or high altitudes (70,000 to 250,000 feet) due to secondary emission. Information pertinent to the problem of low frequency (0 to 1000 cps) sparking was compiled through a literature survey. A bibliography concerning electrical breakdown at both low and high frequencies was compiled. A test program yielded the following results: no statistically significant deviation from Paschen's Law was detected. The addition of water vapor to the air constituting the test environment caused a significant lowering of the minimum sparking voltage. Recommendations are made relative to test programs for missile electrical components employing voltages higher than 200 volts. (Author)

AD-605 985 Div. 12, 15
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE APPLICATION OF PERIODIC SURFACE THEORY TO THE STUDY OF SATELLITE ORBITS,
by W. T. Kyner, S. P. Diliberto, and R. B. Freund.
9 Nov 59, 34p STL/TR-59-0000-09895

Unclassified report

Descriptors: (*Orbital trajectories, Satellites (Artificial)), (*Satellites (Artificial), Orbital trajectories), Theory, Numerical analysis, Differential equations, Functions, Equations, Motion, Integrals, Series, Differential geometry.

This report contains new results on the application of periodic surfaces to the problem of determining the (drag free) orbits of satellites around an oblate earth. The basic mathematical theory is in the NAVORD report (PB-148 042) 'Periodic Surfaces and Satellite Orbits' by S. P. Diliberto. The theory is characterized by the fact that it splits the description of the solutions (in the phase space) into two essentially distinct parts; one element is a description of a surface on which solutions travel, the other is a description of the rotation on such a surface. The theory includes an expansion procedure for finding such surfaces, a simple prerequisite condition which coordinate systems must satisfy so as to allow the possibility of these expansions, and the determination of at least one coordinate system for the satellite problem which satisfies the prerequisite condition. The results include a new method for finding expansions of the solutions on the surfaces (in standard terminology this can be described as an 'expansion for the secular terms'), and the use of energy considerations to find the first term in the surface expansion. In particular, it is shown that the energy integral expressed in these coordinates takes on a fairly simple form.

AD-605 989 Div. 12, 30
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ENVIRONMENTAL EVALUATION CAPABILITY.
Semiannual rept for 1 Jul-31 Dec 59,
by F. P. Klein. 31 Dec 59, 25p STL/TR-59-0000-09956
Contract AF04 647 309
AFBMD TR60 40

Unclassified report

Descriptors: (*Guided missiles, Environmental tests), (*Environmental tests, Guided missiles), Test equipment, Instrumentation, Vibration, Control panels, Data storage systems, Recording systems, Experimental data, Acceleration, Professional personnel, Personnel management, Laboratory equipment.

This report reviews the activities of the Environmental Evaluation Section during the latter half of 1959 and describes the additions or modifications made to the environmental testing equipment in the laboratory. Activities were largely centered around testing for the Able programs, although technical support was furnished for a number of laboratory projects being carried out by other elements of the company, as well as for various aspects of the ballistic missile program. The capability for virtually all types of testing was increased, with particular regard to equipment and instrumentation for vibration testing. Several devices were designed and fabricated in the laboratory to fill special needs, at considerable monetary saving. (Author)

AD-605 995 Div. 12
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
SAMPLE OF ONE RELIABILITY TESTING,
by R. B. Muchmore. 18 Oct 55, 16p RW-AP-2

Unclassified report

Descriptors: (*Reliability, Test methods), (*Guided missiles components, Reliability), Stresses, Failure (Mechanics), Environmental tests, Guided missiles, Probability, Statistical analysis.

For those environmental stresses for which the ideas of Lusser (a study of methods of achieving reliability of guided missiles) apply, a method of estimating the reliability of an assemblage of components is suggested. It is assumed that only one test to failure can be made for each of the different components. It is shown that a simplified and approximate analysis can be performed which yields a lower limit on reliability when the one test is interpreted in a given way and one application of engineering judgement is made. The consequences of an error in judgement are readily apparent from the formulas presented and can thus be allowed for. (Author)

AD-606 013 Div. 12
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.

Descriptors: (*Meteorological satellites, Upper atmosphere), (*Physics laboratories, Scientific satellites), (*Astronomical observatories, Scientific satellites), (*Scientific satellites, Scientific research), Astronomy, Astrophysics, Meteorology, Satellites (Artificial), Cosmic rays, Spectroscopy, Telescopes, Atmospherics, Instrumentation, Atmospheric sounding.

A small future satellite vehicle offers possibilities for major advances in cosmic rays, solar physics, terrestrial meteorology, and in the physics of the earth's upper atmosphere. A larger satellite used as an astronomical observatory would be a revolutionary new tool in astrophysics and cosmology and would contribute to our fundamental knowledge of the nature of the universe. (Author)

AD-605 786 Div. 12, 25
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SATELLITE CHARGE-UP IN THE OUTER VAN ALLEN BELT,
by R. O. Hundley. Sep 61, 42p P-2441
Unclassified report

Descriptors: (*Satellites (Artificial), Van Allen radiation belt), (*Electrostatics, Satellites (Artificial), (*Van Allen radiation belt, Satellites (Artificial)), Electrons, Voltage, Absorption, Secondary emission, Photoelectrons, Electric discharges, Solar radiation, Surface properties, Mathematical analysis, Plasma sheath.

The discussion of satellite charge-up is extended to include the case of satellites in the outer Van Allen belt. Due to the presence of the high energy Van Allen electrons, the electrostatic potentials acquired by satellites in the Van Allen region may be much larger than for the case of ionospheric satellites. Numerical results for the satellite potential are obtained under the assumption of complete absorption of the incident particles, and it is found that for satellites of the size used thus far, potentials of a few kilovolts can be expected, but that for satellites of larger size, potentials up to several tens of kilovolts can be expected. The effects of secondary electron emission and photoelectron emission are investigated. It is found that secondary electrons will have only a minor effect, but that for some surface materials the effect of photoelectron emission due to solar radiation may completely cancel out the large potentials. (Author)

AD-605 903 Div. 12, 22
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DEVELOPMENT OF OPERATIONAL AND STRATEGIC ROCKETS IN THE UNITED STATES,
by I. Zheltikov. 25 Mar 64, 22p
FTD MT63 239; TT 64 71424
Unclassified report

Edited machine trans. of Voenno-Istoricheskii Zhurnal (USSR) 1963, v. 5, no. 2, p. 37-47.

Descriptors: (*Guided missiles, United States), (*Rockets, United States), History, Launching sites, Payload, Armament, Strategic weapons, Liquid rocket fuels, Solid rocket fuels, Control systems, Periodicals, USSR.

In the given article there are considered only certain questions of the history of development of long-range rocket weapons in the United States in the postwar period and the basic tendencies of development of American rocket technology. This development is on the road to improvement of technical-tactical and characteristics of the rocket weapon and the broadening of the scope of the execution of firing problems. The military and political leadership of the United States, depending mostly in a new war on the nuclear rocket weapon, are applying great efforts for the development and creation of 'second generation' ballistic rockets with solid-fuel engines, reliable and accurate systems of control, mobile launching equipment and interchangeable warheads.

AD-605 918 Div. 12, 22
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE OPTIMIZATION OF TWO-STAGE ROCKETS,
by M. Goldsmith. 3 Jan 57, rev. 29 Jan 57, 12p
P-1004
Unclassified report

Descriptors: (*Rockets, Load distribution), Staging, Second-stage motors, Structural properties, Specific impulse, Rocket propellants, Burning rate, Payload, Otimization, Mathematical analysis.

Equations useful in design studies are derived for determining the optimum weight distribution for two-stage tandem rockets for the case of different structural factors and propellant specific impulses in each stage. Minimization of gross weight for a given required burnout velocity and payload is the criterion of optimization used. For illustrative purposes an example is included in which the optimum distribution is found for a hypothetical chemically-boosted atomic rocket. (Author)

AD-605 929 Div. 12
OTS Prices: HC $3.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
DESCENT TRAJECTORIES FOR MANNED SPACE VEHICLES,
by R. L. Phillips. 20 Jun 58, 54p
STL-GM-TR-0165-00416
Unclassified report

Descriptors: (*Re-entry vehicles, Design), (*Descent trajectories, Atmosphere entry), (*Atmosphere entry, Descent trajectories), Aerodynamic heating, Manned spacecraft, Deceleration, Lunar satellites, Heat shields, Elliptical orbit trajectories.

The problem of designing a manned space vehicle which must survive entry into the earth's atmosphere is discussed from the systems point of view. In the design of such a vehicle peak deceleration loads become an important consideration. This aspect of the problem together with the aerodynamic heating and landing point dispersion factors is considered for two classes of re-entry bodies: (1) returning low-altitude satellite, and (2) vehicles which re-entry at or near escape velocity such as circumlunar vehicles. Finally, the heat shielding problem is presented in detail along with some solutions. (Author)

AD-605 979 Div. 12, 9
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
ON THE AERODYNAMIC RESPONSE OF A SLENDER BODY OF REVOLUTION TO GUSTS.
Memorandum,
by Y. C. Fung. 19 Aug 54, 9p Unclassified report

parameter variations on the missile's trajectory. The equations usually used to describe this problem are not particularly adaptable to the analogue computer due to the parameter values and ranges of the variables. It was found necessary to make certain approximations and also to use perturbation techniques along with a dual time scale. (Author)

AD-606 110 Div. 12, 26
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
A GUIDE FOR ENVIRONMENTAL DESIGN REQUIREMENTS FOR NON-AIRBORNE EQUIPMENT.
10 May 56, 27p GM04.1-20-HK, G56-4
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Guided missiles (Surface-to-surface), Ground support equipment), (*Ground support equipment, Design), Checkout equipment, Command guidance, Environmental tests, Test facilities, Test methods, Performance (Engineering), Military requirements, Specifications, Production.

This document presents the environmental design criteria for the design and test of non-airborne equipment for the WS-107A. It is a guide in the preparation of general and detail specifications for the three types of non-airborne equipment which includes ground guidance equipment, ground support equipment, and ground guidance support equipment.

AD-606 115 Div. 12, 7, 26
OTS Prices: HC $1.00/MF $0.50

Frebank Co., Glendale, Calif.
PRESSURE SWITCH.
Technical progress rept. no. 25, 1-29 Feb 60,
by M. D. Ferguson. 29 Feb 60, 5p
Contract AF04 647 158
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Pressure switches, Design), Guided missile components, Manufacturing methods, Materials, Stainless steel, Environmental tests, Test methods, Performance (Engineering), Corrosion inhibition, Temperature.

The development of medium and low pressure switches is reported. Included are descriptions of qualification tests, materials used, mileposts, and problem areas.

AD-606 123 Div. 12, 2, 22
OTS Prices: HC $3.00/MF $0.75

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
HYPERVELOCITY IMPACT CALCULATIONS AND THEIR CORRELATION WITH EXPERIMENT.
Interim rept. no. 2,
by T. D. Riney and J. F. Heyda. Sep 64, 80p R64SD64
Contract AF08 635 3781
Unclassified report

Also see AD-434 220.

Descriptors: (*Hypervelocity projectiles, Terminal ballistics), (*Terminal ballistics, Mathematical models), Mathematical analysis, Cratering, Penetration, Velocity, Metal plates, Thickness, Iron, Aluminum, Lead, Strain (Mechanics), Plasticity, Viscosity, Pressure, Density, Impact shock, Meteors.

Additional calculations are presented which confirm the previous conclusion that in a thick target the depth of penetration, of geometrically similar projectiles of like metal, varies with the impact velocity according to the impact velocity to the 2/3rds power in the hypervelocity regime. Calculations are also given which show that the crater dimensions are relatively insensitive to the density of homogeneous projectiles. Experimentally observed size effects are discussed in terms of the visco-plastic model and it is concluded that the threshold velocity for energy scaling will depend somewhat on the dimensions of the projectile. Finite plate calculations are also presented for several plate thicknesses. Moreover, the spatial divergence of the spallation bubble and the corresponding decrease in the momentum density is obtained as a function of the stand-off distance for two impact situations. Preliminary calculations are also included for impact into a target consisting of two spaced plates. (Author)

AD-606 129 Div. 12, 10, 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
GENERALIZED MISSILE DYNAMICS ANALYSIS.
IV. SLOSHING,
by J. W. Miles and Dana Young. 7 Apr 58, 9p
STL/GM-TR-0165-00361; STL/EM-8-10
Unclassified report

Descriptors: (*Sloshing, Energy), (*Guided missiles, Dynamics), Fuels, Hydrodynamics, Kinetic theory, Potential theory, Fuel tanks, Geometry, Equations, Motion, Guided missile components.

The kinetic and potential energies associated with fuel sloshing are calculated for incorporation in Generalized Missile Dynamics Analysis, II (PB-163 578). Equations of Motion.

IN-FLIGHT DYNAMICS OF A FLEXIBLE MISSILE,
by H. E. Lindberg. 20 Apr 60, 70p
STL-EM-10-4, STL/TR-60-0000-00083
Unclassified report

Descriptors: (*Guided missiles, Motion), Aerodynamic characteristics, Dynamics, Sloshing, Acceleration, Rotation, Guided missile components, Engines and motors, Flight.

Equations are derived for the motion of a missile in a plane, including bending, sloshing, engine swiveling, axial acceleration, and aerodynamics. The bending and sloshing are treated by means of combined bending-sloshing modes in which the first slosh mode in each tank is represented by an equivalent lateral spring-mass system. Also included are equations for the moment and shear in the missile expressed in terms of a psuedo-static moment and shear plus correction terms which account for the dynamic over-shoot of the bending-sloshing modes.

AD-606 021 Div. 12, 15
OTS Prices: HC $1.00/MF $0.50

Operations Analysis Office, Air Force Missile Test Center, Patrick AFB, Fla.
A STATISTICAL PROCEDURE FOR CUT-OFF AND SCHEDULING POLICY,
by Norman Lindemann. 10 Dec 58, 8p
OA-WP-58-8
Unclassified report

Descriptors: (*Guided missiles, Scheduling), (*Scheduling, Launching), (*Launching, Scheduling), Mathematical models, Probability, Statistical analysis, Checkout procedures, Abort.

A mathematical model is formed which is applicable to missile launches for which scrubs might be called. Hold time data from several missile programs were analysed and the nature of the statistical form studied. Probability curves were computed showing the amount of time which should be available in order to launch before the deadline.

AD-606 066 Div. 12, 15
OTS Prices: HC $5.00/MF $1.00

Douglas Aircraft Co., Inc., Santa Monica, Calif.
INVESTIGATION OF CONTROL DATA REQUIREMENTS FOR SUPER-ORBITAL RE-ENTRY,
by W. R. Bush and R. G. Seibert. Aug 64, 152p
Contract AF33 657 11544, Proj. 8222, Task 822202
FDL TDR64 118
Unclassified report

Descriptors: (*Atmosphere entry, Numerical methods and procedures), Reentry vehicles, Descent trajectories, Optimization, Statistical analysis, Programming (Computers), Graphics.

This report was prepared to document the information developed in a study of superorbital approaches to planetary atmospheric entry. The areas covered by this report include a method for computing the impulse optimum approach trajectory to a landing point, given the position and orbit of the space vehicle. Also included is a method of statistically determining the expected impulse required for an approach to the earth with imperfect measuring devices, imperfect thrusting devices, and imperfect knowledge of the initial orbit. This is done where corrections are based on distance to earth, or the size of the required correction. Also included is a statistical method of computing the optimum number and locations of corrections along an approach to enter the earth's atmosphere. The most important result of this study is not the data that is presented, but the methods of study and the tools that have been developed and mechanized to study the planetary approach problem. (Author)

AD-606 091 Div. 12, 27
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
OPTIMUM PROGRAM FOR SINGLE STAGE ROCKETS IN WHICH EXPELLANT IS NOT THE SOURCE OF POWER,
by J. H. Irving. 7 Oct 56, 17p
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction will be made from best available copy.

Descriptors: (*Rocket trajectories, Optimization), Rockets, Gravity, Thrust, Rocket propulsion, Equations, Motion.

The gravitational force and the thrust force are considered in the derivation of an optimum mass rate and exhaust velocity program.

AD-606 100 Div. 12
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME NEW SOVIET MATERIAL ON MISSILES,
by Herbert S. Dinerstein. 20 Jun 57, 26p T-73
TT 64 71439
Unclassified report

Partial trans. excerpts from mono. Nauka: Tekhnika Sovremennykh Voinakh (Science and Technology in Modern Wars) by G. I. Pokrovskii, Moscow, 1956.

Descriptors: (*Guided missiles, USSR), (*Weapon systems, USSR), Strategic weapons, Tactical weapons, Defense systems, Nuclear weapons, Military operations, Ordnance, Aircraft, Costs, Guided missiles (Surface-to-surface).

This document contains excerpts of recently acquired Soviet published material on missiles. The book from which the material is excerpted contains an explicit Soviet discussion of the expected accuracy of long-range ballistic missiles, their strategic importance, and the ease with which they might be detected.

AD-606 105 Div. 12, 2, 30
OTS Prices: HC $1.00/MF $0.50

Army Missile Command, Redstone Arsenal, Ala.
SIMULATION OF FLIGHT PATHS TO THE MOON,
by John P. Gibbons and Frederick T. Shaver.
14 Mar 58, 18p
AMC-RA DC TN215
Unclassified report

Legibility of this document is in part unsatisfactory, Reproduction has been made from best available copy.

Descriptors: (*Lunar trajectories, Simulation), (*Astronautics, Lunar trajectories), Guided missile trajectories, Moon, Celestial mechanics, Gravity, Perturbation theory, Mathematical models.

The system consists of the moon, the earth, and a missile in free fall flight from the earth to the moon. It was desired to simulate this system in two dimensions on an analogue computer in order to observe the effect of small

AD-605 896 Div. 13
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TECHNOLOGY OF SUBMERSION AND INJECTION OF A CYLINDRICAL REINFORCED CONCRETE PILING,
by B. P. Konstantinov. 30 Dec 63, 12p
FTD MT63 127; TT 64 71417

Unclassified report

Edited machine trans. of Transportnoe Stroitel'stvo (USSR) 1962, v. 12, no. 10, p. 46-48.

Descriptors: (*Reinforced concrete, Foundations (Structures)), (*Foundations (Structures), Reinforced concrete), Construction, Cylindrical bodies, Pipes, Underwater, USSR.

Experimental submersion is described of a cylindrical reinforced concrete piling designed by the TsNIIS, 10 sections were made 6 m in length (for five 12-m rabbets), with external diameter of 1.55 m, weighing 95 m each. The rabbets were submerged to an experimental section, located on the shore. The ground, into which the piling was sunk, is characterized by the following properties: angle of natural slope of dry sand 34--37 degrees and wet -- 31--33 degrees; volume weight of sand 1.49--1.60 g/cm. The granulometric composition of the sand is given in the table. The Horizon mark of the ground waters is 6.5--7m. Submersion of the rabbets is accomplished in four stages.

AD-606 127 Div. 13, 33
OTS Prices: HC $1.00/MF $0.50

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
SOME PROPERTIES OF SAWDUST-SNOW-ICE MIXTURES.
Special rept.,
by Gunars Abele. Jul 64, 15p
CRREL SR60

Unclassified report

Descriptors: (*Snow, Trafficability), (*Trafficability, Snow), Wood, Ice, Mixtures, Loading (Mechanics), Additives, Safety, Tensile properties, Compressive properties, Hardness, Cold weather tests, Reinforcing materials, Transportation.

Previous studies on the supporting capacity of snow pavements have indicated that heavy wheel loads, 40,000 lb, producing contact pressures up to 150 psi, can be supported on dry-processed, age-hardened snow pavements. It may be desirable to expand this study further by developing methods for constructing snow pavements capable of supporting even higher wheel loads with higher contact pressures. The use of additives in snow pavements to increase its strength has been considered. So far, however, the study of such additives has been limited to sawdust and wood chips. Preliminary studies on sawdust-snow mixtures were performed at the Keweenaw Field Station and in Greenland with a dual purpose: (1) to determine the increase in the bearing capacity of a processed snow pavement to which sawdust had been added, (2) to observe the skid reducing properties of a sawdust-snow pavement surface. It can be assumed that there exists an optimum amount of sawdust that can be added to processed snow with favorable results. This optimum sawdust content has not been determined. The additon of some sawdust to processed snow increases the ultimate bearing capacity of snow. There are indications that if the amount of sawdust exceeds a certain percentage, the age-hardening process will be retarded. Foreign particles in processed snow will decrease the snow grain-to-grain contact which is necessary for age hardening to occur.

AD-606 142 Div. 13, 2, 22, 30
OTS Prices: HC $4.00/MF $1.00

IIT Research Inst., Chicago, Ill.
SHOCK UNLOADING CHARACTERISTICS OF CRUSHABLE ROCKS.
Final rept. for 1 May 63-31 Mar 64,
by A. H. Wiedermann and O. E. Curth. Aug 64, 144p
Contract AF29 601 6007, Projs. 1080, T6050, Task 108007
WL TDR64 52

Unclassified report

Descriptors: (*Engineering geology, Shock (Mechanics)), (*Shock (Mechanics), Rock (Geology)), (*Rock (Geology), Shock (Mechanics)), Igneous rock, Mechanical properties, Shock waves, Propagation, Explosion effects, Test methods.

The unloading characteristics of dry volcanic tuff were observed for two initial shock states. The unloading paths in the stress-particle velocity plane differed substantially from the reflected Hugoniot curve passing through the corresponding initial shock state. Thus the unloading process does not follow the usually assumed Hugoniot unloading path. The net results of this behavior are that (1) the quantity of energy dissipated in the shock process is considerably greater than that normally assumed, and (2) the propagation speeds of the unloading waves are considerably greater than those normally assumed. For shock stress intensities of approximately 100 and 200 kilobars it was determined that the amount of energy dissipated at the shock front has been underestimated by 20 to 30 percent, and that the remaining useful energy has been overestimated by approximately 50 percent. Furthermore, the unloading wave speed for these cases has been underestimated by approximately 20 to 25 percent. A correlation was made between Hugoniot data obtained during this program and other Hugoniot data for dry volcanic tuff of various initial densities. It was found that, when presented in terms of absolute density, all of the Hugoniot states above a critical stress level were located on a single Hugoniot curve. This resulting aggregate mineral Hugoniot correlates well with Hugoniots for the basic nonporous constituents of the geologic materials. (Author)

13. Installations and Construction

AD-605 215 Div. 13, 14
OTS Prices: HC $6.00/MF $1.25

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
THEORETICAL-EXPERIMENTAL CORRELATION OF LARGE DYNAMIC AND PERMANENT DEFORMATIONS OF IMPULSIVELY-LOADED SIMPLE STRUCTURES,
by Hans A. Balmer and Emmett A. Witmer.
Jul 64, 256p ASRL-110-2
Contract AF33 657 8427, Proj. 6906, Task 690601
FDL TDR64 108

Unclassified report

Descriptors: (*Structures, Deformation), Structural parts, Beams (Structural), Rings, Loading (Mechanics), Stresses, Strain (Mechanics), Elasticity, Plasticity, Mathematical prediction, Mathematical analysis, Correlation techniques, Aluminum alloys, Materials, Hardening, Creep.

A general numerical method previously developed for analyzing large dynamic two-dimensional deformations of simple structures (and of large axisymmetric dynamic deformations of plates and shells with rotational symmetry) was extended and evaluated through comparisons of predictions with experimental dynamic response and permanent-deformation data from explosively-loaded beams and circular rings. The method accounts for elastic, perfectly-plastic, strain hardening, and strain rate behavior of the structural material, and the experimental specimens employed were chosen to emphasize one or more of these characteristics and to provide tests of the adequacy of the theoretical prediction method.

AD-605 292 Div. 13, 25
OTS Prices: HC $1.00/MF $0.50

Columbia Univ., New York.
FINITE DEFLECTIONS OF VISCOELASTIC CANTILEVERS.
Technical rept. no. 18,
by M. A. Schoenberg and H. H. Bleich. Jul 64, 18p
CU-1-64-ONR-266(34)-CE
Contract Nonr266 34, Proj. NR064 417

Unclassified report

Descriptors: (*Cantilever beams, Deflection), Viscoelasticity, Creep, Integral equations, Computers.

AD-605 762 Div. 13, 25
OTS Prices: HC $3.00/MF $0.50

Fritz Engineering Lab., Lehigh Univ., Bethlehem, Pa.
TEST ON LONGITUDINALLY STIFFENED PLATE PANELS WITH FIXED ENDS: STRAIN AND DIAL GAGE READINGS,
by Jun Kondo and Alexis Ostapenko. Jul 64, 56p
Fritz-248.12A, Fritz-248.12, suppl.
Contracts NObs88221, NObs90041

Unclassified report

Rept. on Built-Up Members in Plastic Design.

Descriptors: (*Panels (Structural), Loading (Mechanics)), (*Loading (Mechanics), Panels (Structural)), Experimental data, Strain (Mechanics), Plasticity, Deformation, Meters, Tables, Reinforcing materials, Tests, Metal plates, Load distribution.

This report contains all the readings of the strain and dial gages taken during the tests. The readings are presented in the form of tables. Neither smoothing nor zero adjustment of the data was carried out--the data were only reduced to the first reading whether it was at a zero load or not. The strain gage readings are given in Tables 1 to 4 and the dial gage readings in Tables 5 to 8. Each table contains the readings for one specimen. Nominal dimensions of the test specimens are shown in Fig. 1 on page 2. (Author)

AD-605 785 Div. 13
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THROW-AWAY MAINTENANCE POLICIES,
by Chauncey F. Bell. Oct 61, 4p P-2453

Unclassified report

Descriptors: (*Logistics, Maintainability), (*Maintainability, Logistics), Management engineering, Decision making, Reliability, Storage, Costs.

The purpose of this report is to explore those areas where there is, or can be, a choice between the policies of throw-away and of repair or renewal. The discussion lists the advantages and disadvantages most commonly advanced in support of each policy as well as the important parameters to be considered in arriving at policy decisions.

AD-605 807 Div. 13, 25
OTS Prices: HC $4.00/MF $1.00

Fritz Engineering Lab., Lehigh Univ., Bethlehem, Pa.
WELDED CONTINUOUS FRAMES AND THEIR COMPONENTS: ANALYSIS OF BEAM-AND-COLUMN SUBASSEMBLAGES IN PLANAR MULTI-STORY FRAMES,
by Victor Levi, George C. Driscoll, Jr., and Le-Wu Lu.
Jul 64, 130p Fritz-273.11
Contract Nonr610 03

Unclassified report

Partly sponsored by the Welding Research Council.

Descriptors: (*Buildings, Design), (*Beams (Structural), Buildings), (*Structures, Engineering), Welds, Loading (Mechanics), Deformation, Strength, Stresses, Joints, Elasticity, Flexible structures, Failure (Mechanics), Stability, Construction, Supports, Mathematical analysis, Mechanics, Supports.

Methods are developed for the analysis of beam-and-column subassemblages which constitute a part of a two-dimensional multi-story frame. A subassemblage consists essentially of a column which is framed at its two ends with beams of known properties. When such a structure is subjected to load, the beams will deform with the column and thus provide rotational restraint at the ends of the column. The strength of the subassemblage therefore depends on not only the strength of the column member but also that of the beams. Two types of subassemblages are analyzed by the procedures presented; namely, the sway type and the nonsway type. A sway subassemblage is a subassemblage whose upper joint may translate with respect to the lower joint when subjected to load. Any horizontal force which is applied to the subassemblage is resisted by the column and the restraining beams. In a nonsway subassemblage, translation of the joints is assumed to be prevented and the lateral forces applied at the level of the joints are resisted directly by the supports. Another problem studied by the method developed for nonsway subassemblages is the analysis of beam-columns continuous over several supports.

Descriptors: (*Polyethylene plastics, Spinning), (*Fibers (Synthetic), Polytethylene plastics), Tensile properties, Manufacturing methods, Extrusion, Thermal insulation, Nitrogen.

Improved spinning speeds up to 900 ft/min were reached. A larger diameter (.040 inch) spinneret, discounting presumably some of the melt fracture limitations experienced with the smaller diameter spinnerets, permitted higher thermal jacket temperatures to be used and as a result the higher spinning speeds. The evaluation of the low thermal hazard extrusion head remains incomplete and the desired increase in I. V. was not obtained. (Author)

AD-605 261 Div. 14, 8
OTS Prices: HC $5.00/MF $1.00

Radio Corp. of America, Lancaster, Pa.
IMPROVED ELECTROLUMINESCENT PHOSPHORS.
Final rept.,
by S. A. Harper. Aug 64, 162p
Contract AF30 602 2917, Proj. 5578, Task 557803
RADC TDR64 159

Unclassified report

Descriptors: (*Phosphorescent materials, Zinc compounds), (*Zinc compounds, Electroluminescence), (*Electroluminescence, Phosphorescent materials), Powders, Selenides, Sulfides, Excitation, Brightness, Spectroscopy, Particle size, Sintering, Dielectrics, Epoxy plastics, Films, Impurities, Copper, Bromine.

The report describes the results of studies on the performance characteristics of electroluminescent (EL) zinc sulfoselenide phosphor powders in plastic dielectrics. The objective of the investigation was to develop phosphors which yielded exceptional brightness under pulsing conditions as well as improved performance under continuous excitation at both high and low voltages. Phosphors were evaluated under short bursts of AC (pulsed) excitation with the frequency within the pulse varying from 20-100kc. About 5000 ft. L. of brightness was obtained during pulse intervals and maximum bursts were measured close to 10,000 ft. L. Under continuous excitation at 420 cps, three selected phosphors emitting in the green-yellow, light yellow and deep yellow region displayed initial brightnesses of about 97, 60 and 33 ft. L. The maintenance (hours to one-half of initial brightness) of these same layers was about 2200, 4500, and 8000 hours respectively. Phosphors were also evaluated in thin low voltage layers at 25 and 50 volts. At 1500 cps, the brightnesses varied from 2.5 to 24 ft. L. while the maintenance was in the range of 150 to 500 hours. (Author)

AD-605 299 Div. 14, 4
OTS Prices: HC $2.00/MF $0.50

Olin Mathieson Chemical Corp., New Haven, Conn.
DEVELOPMENT OF A FIRE-RESISTANT WATER-BASE HYDRAULIC FLUID.
Bimonthly progress rept. no. 2, 1 Jul-31 Aug 64,
by G. F. Ottmann. 9 Sep 64, 28p
Contract NObs90268

Unclassified report

See also AD-602 133.

Descriptors: (*Hydraulic fluids, Synthesis (Chemistry)), Amines, Phenols, Alcohols, Halogens, Ethylene oxide, Propanols, Flammability, Ignition, Viscosity.

The alkoxylation of 2,4-toluylene diamine, polyhalogenated phenols, and polyfluoro alcohols with alkylene oxides such as ethylene oxide, propylene oxide, and glycidol was studied. The majority of the reaction products was water-soluble, met the specifications for flash points and flame points but failed to pass the autogenous ignition test. Alkoxylation of methylene dianilines, methylene diphenols, p,p'-diphenol, hydroxymethyl diphenyloxides, and hydroxydiphenyl oxides with ethylene oxide and/or glycidol gave a variety of water-soluble products which met the specifications for flash point, flame point, and autogenous ignition temperature. None of the alkoxylated products met the viscosity specification of 850 cs or below at 25F after being adjusted to 28 ± 3 cs at 150F by addition of water. (Author)

AD-605 307 Div. 14
OTS Prices: HC $1.00/MF $0.50

United States Polymeric Chemicals, Inc., Santa Ana, Calif.
DEVELOPMENT AND EVALUATION OF IMPROVED RESINS FOR FILAMENT WOUND PLASTICS.
Quarterly rept. no. 2,
by T. F. Downey. 31 May 64, 18p
Proj. 208LR107

Unclassified report

Descriptors: (*Filament wound construction, Binders), (*Epoxy plastics, Stability), Fibers, Glass textiles, Carbon, Impregnation, Storage, Aging (Materials), Physical properties, Underwater equipment, Pressure vessels, Ablation.

There are other requirements for pre-impregnated materials in addition to their uniformity, handling convenience, excellent physical and chemical properties and reproducibility. One of these requirements is an increased stability at room temperature. Thus, polymers which afford a longer shelf life are being evaluated. Emphasis was also placed on two additional areas: the development of pre-impregnated roving for deep submergence applications, where increased physical strength is needed, and the development of pre-impregnated materials to be used for ablative applications. (Author)

AD-605 313 Div. 14, 4
OTS Prices: HC $1.00/MF $0.50

Monsanto Research Corp., Dayton, Ohio.
MOLECULAR STRUCTURE AND MATERIALS CHARACTERIZATION.
Summary rept. for 1 Jul 61-15 Mar 64,
by J. E. Katon. Jun 64, 22p
Contract AF33 616 8465, Proj. 7360, Task 736005
ML TDR64 157

Unclassified report

Descriptors: (*Materials, Analysis), (*Molecular structure, Determination), Organic compounds, Infrared spectroscopy, Polymers, Thermochemistry, Solid rocket propellant binders, Isocyanate plastics, Chromatographic analysis.

The report summarizes the research programs, methods development and service functions covering determination of molecular structures, characterization of materials, and development and application of various analytical techniques. The research projects, reported in detail is separate reports and in technical journal publications, concern: (1) infrared spectra-structure correlation of a number of classes of organic compounds; (2) solid state mass spectrometry; (3) application of thermogravimetric and differential thermal analysis techniques to the characterization of high temperature polymeric system; (4) characterization of polyurethane elastomers with special reference to those used as binders for solid propellants; (5) the design, construction and

14. Materials (Non-Metallic)

AD-605 179 Div. 14
OTS Prices: HC $7.00/MF $1.50

Aerojet-General Corp., Sacramento, Calif.
DEVELOPMENT OF IMPROVED RESIN SYSTEMS FOR FILAMENT-WOUND STRUCTURES.
Final rept. for 25 Jun 63-29 May 64,
by J. J. Cooney. Aug 64, 330p AGC-0627-VI-F
Contract NOw63 0627c, Task VI
Unclassified report

Descriptors: (*Filament wound construction, Binders), (*Epoxy plastics, Filament wound construction), Physical properties, Hardening, Glass textiles, Fibers, Pressure vessels, Rings, Shear stresses, Tensile properties, Deformation, Transition temperature.

The report shows by regression equations and charts of response surfaces the relationships between five resin system parameters and 18 physical properties of the resins. The results are based on 31 experiments arranged in a Central Composite Design for each of seven hardeners. Statistical techniques were used for designing the experiments and interpreting the results. The results indicate that the type and amount of hardener used are the most important of the parameters studied in effecting changes of properties, especially for those resin systems that contain amine hardeners. The relationships that exist between the physical properties of the resins and those of a filament-wound composite were investigated through the fabrication and bursting of 70 pressure vessels and short-span flexural tests of samples from 140 Naval Ordnance Laboratory type rings for interlaminar shear-strength determinations. (Author)

AD-605 187 Div. 14, 26
OTS Prices: HC $2.00/MF $0.50

Narmco Research and Development Div., Whittaker Corp., San Diego, Calif.
DEVELOPMENT OF LAMINATING RESINS, CONTROLLED PROCESSES, AND TEST METHODS FOR GLASS FILAMENT WOUND REINFORCED PLASTIC.
Detailed work statement,
1959, 48p
Contract AF33 616 6737, Proj. 7340, Task 73400
Unclassified report

Descriptors: (*Laminated plastics, Filament wound construction), Laminates, Composite materials, Glass textiles, Reinforcing materials, Heat-resistant materials, Pressure vessels, Rocket cases, Cylindrical bodies, Mechanical properties, Test methods, Plastics.

This program consists of three phases: (Phase I) Plastic laminating resins which will provide high strength and high temperature resistant glass filament wound reinforced composite. (Phase II) Optimum material and process parameters for cylindrical filament wound pressure vessels such as solid propellant rocket cases, and (Phase III) Procedures for defining the basic mechanical properties of the filament wound glass fiber-plastic resin composites. (Author)

AD-605 199 Div. 14, 12
OTS Prices: HC $4.00/MF $0.75

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE SUBLIMATION OF GRAPHITE AT HYPERSONIC SPEEDS,
by S. M. Scala and L. M. Gilbert. Aug 64, 104p
R64SD55
Contracts AF04 647 269, AF04 694 222
Unclassified report

Prepared for presentation at the AIAA Entry Technology Conference, NASA Langley Research Center, 12-14 Oct 64.

Descriptors: (*Graphite, Sublimation), (*Hypersonic flight, Graphite), Hypersonic characteristics, Mathematical models, Gases, Air, Differential geometry, Transport properties, Thermodynamics, Boundary layer, Reaction kinetics, Reynolds number, Laminar flow, Friction, High-temperature research, Refractory materials, Aerospace craft, Ablation, Heat shields, Aerodynamic heating, Re-entry vehicles, Surface temperatures, Pressure, Pyrolytic graphite, Aerodynamic control surfaces.

A new theoretical model is presented for the sublimation of graphite at hypersonic flight speeds. The aerothermochemical interactions between dissociated air and graphite are treated by means of a nine component model, including O, O2, N, N2, CO, CO2, C, C3 and CN. The mass transfer rate, the heat transfer rate, and the skin friction coefficient are determined numerically and are then correlated by means of algebraic equations, as a function of stagnation pressure, stagnation enthalpy and wall temperature in the high Reynolds number laminar flow regime. (Author)

AD-605 214 Div. 14
OTS Prices: HC $3.00/MF $0.75

Army Chemical Research and Development Labs., Edgewood Arsenal, Md.
MATERIALS REVIEW (15th).
Rept. for Jul 63-Jan 64,
by Arthur Lyem. Jun 64, 100p
Proj. 1C522301A075
CRDL SP5 4
Unclassified report

Descriptors: (*Materials, Reviews), (*Plastics, Reviews), Polymers, Fibers (Synthetic), Textiles, Organic compounds, Inorganic compounds, Metals, Alloys, Corrosion, Chemistry, Manufacturing methods, Toxicology, Bibliographies, Abstracting.

The purpose of the semiannual review is to present technical and scientific highlights regarding materials research here and abroad. Provided is information concerning recent technological advances, which are presented under five major headings: High polymers, plastic materials, synthetic fibers, miscellaneous organic and inorganic compounds, and metals and alloys. Over 300 articles have been abstracted from various publications and languages. Materials and technological aspects are discussed, and a complete bibliography is given. (Author)

AD-605 222 Div. 14, 26
OTS Prices: HC $1.00/MF $0.50

United States Rubber Co., Wayne, N. J.
RESEARCH AND DEVELOPMENT OF HIGH TENACITY FIBERS: POLYOLEFINS.
Final rept. for 1 May-31 Jul 64,
by H. P. Kato and J. S. Lasky. 25 Aug 64, 24p
Contract Nonr3767 00
Unclassified report

See also AD-601 403

Descriptors: (*Ceramic materials, Crystallography), (*Zirconates, Mechanical properties), (*Strontium compounds, Zirconates), Thermal expansion, Stresses, Strain (Mechanics), Compressive properties, Single crystals, Crystal growth, Phase studies, Hysteresis, Electron microscopy, Crystals.

The thermal expansion of both C.P. and 'Commericial' SrZrO3 in hot pressed polycrystalline form has been determined. These measurements are not entirely in agreement with those obtained by X-ray powder techniques. Efforts to grow single crystals of SrZrO3 have continued. (Author)

AD-605 479 Div. 14, 4, 25, 26
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
OPTICAL GLASS WITH LOW REFRACTION INDEX,
by I. M. Buzhinskii, A. A. Michurina, and V. N. Soldatova. 5 Aug 64, 5p
FTD TT64 627; TT 64 71322

Unclassified report

Unedited rough draft trans. of Russian patent 154007 (appl. 777295/29-14, 10 May 62).

Descriptors: (*Optical glass, Refractive index), (*Refractive index, Optical glass), Glass, Silicon compounds, Aluminum compounds, Oxides, Manufacturing methods, USSR.

A glass is described containing by weight, SiO2, 26 to 80%; Al2O3, 7 to 40%; KF, 4.5 to 36% and in excess of 100% by introduction of F up to 6% by weight. This provides a glass of a lower refraction index of 1.4273 to 1.5000, and having a medium dispersal of 0.00600 to 0.00805 with a dispersal coefficient in a range of 71 to 62. A glass of this type may contain a small quantity of other substances which do not materially affect its basic properties. The glass in question is cooked by the ordinary technological process and its manufacture is accomplished by pressure, blowing, bending and other known methods. (Author)

AD-605 506 Div. 14
OTS Prices: HC $4.00/MF $1.00

General American Transportation Corp., Niles, Ill.
THE MECHANICAL BEHAVIOR OF FABRICS SUBJECTED TO BIAXIAL STRESS: CANAL-MODEL THEORY OF THE PLAIN WEAVE.
Rept. for May 63-15 May 64,
by Dell A. Davidson. Jul 64, 130p
Contract AF33 657 8479, Proj. 7320, Task 732002
ML TDR64 239

Unclassified report

Descriptors: (*Textiles, Stresses), Strain (Mechanics), Rupture, Shear stresses, Physical properties, Weaving, Models (Simulations), Geometry, Programming (Computers).

The report presents the results of a theoretical and experimental investigation of the mechanical response of plain weave fabrics to uniform biaxial stress. A theory was derived to predict fabric strains and rupture, based on the use of a 'canal' model of the weave, which characterizes the threads of the weave as round, inextensible, laterally incompressible, perfectly flexible, and frictionless. This model is more accurate than the usual 'trellis' model of the weave, in which the threads are assumed to be straight and frictionlessly pinned at each thread junction. The canal-model theory of the plain weave was applied to all possible states of biaxial stress, and a FORTRAN program was written to compute fabric strains and rupture criteria for plain weaves of any dimensions. The accuracy of canal-model predictions was evaluated experimentally, and compared with the accuracy of similar trellis-model predictions. Shear strain errors of 10 percent were found for the canal-model theory, compared with errors of 90 to 125 percent for the trellis-model theory. (Author)

AD-605 510 Div. 14, 30
OTS Prices: HC $6.00/MF $1.25

Automation Industries, Inc., Boulder, Colo.
APPLIED RESEARCH TO ESTABLISH INFRARED DETECTION METHODS FOR NONDESTRUCTIVE ANALYSIS OF METALLIC AND CERAMIC STRUCTURES, PART III.
Rept. for Feb 63-Jan 64,
by D. R. Maley and S. W. Maley. Mar 64, 211p
Contract AF33 616 7725, Proj. 7360, Task 736002
ASD TDR62 385 P3

Unclassified report

Descriptors: (*Non-destructive testing, Materials), Metals, Ceramic materials, Refractory coatings, Test methods, Heat transfer, Surface temperatures, Infrared detectors, Feasibility studies, Radiometers.

The feasibility study on thermal nondestructive evaluation of materials was continued. (See also AD-605 511) Various material properties or defects in samples were evaluated by one or both of two basic testing methods, known as the scan heat technique and the heat support technique. Both methods operate on the principle that heat transfer rates through a material are dependent on the properties of the material and the presence of internal defects. Heat is introduced at the surface of a sample. Its transfer away from the surface into the sample is gauged by continuous monitoring of surface temperature with an infrared radiometer. The scan heat technique utilizes a moving spot heat source, while the heat support technique relies on large area heating. Material parameters studied included voids and unbonds, adhesion of plating, cracks in coatings, bulk and surface deformation, grain size, and analysis of alloys. Several analytical solutions to the heat conduction equation were utilized for test parameter evaluation and the development of the heat support technique. (Author)

AD-605 511 Div. 14, 30
OTS Prices: HC $4.00/MF $0.75

Automation Industries, Inc., Boulder, Colo.
APPLIED RESEARCH TO ESTABLISH INFRARED DETECTION METHODS FOR NONDESTRUCTIVE ANALYSIS OF METALLIC AND CERAMIC STRUCTURES, PART II.
Rept for Jan 62-Feb 63,
by D. R. Maley, H. T. Pinnick, and R. J. Barton.
Aug 63, 109p
Contract AF33 616 7725, Proj. 7360, Task 736002
ASD TDR62 385 P2

Unclassified report

Descriptors: (*Non-destructive testing, Materials), Metals, Alloys, Aluminum alloys, Ceramic materials, Physical properties, Test methods, Heat transfer, Surface temperatures, Feasibility studies, Infrared radiation, Radiometers.

evaluation of gas-liquid chromatographic fraction collecting accessories. (Author)

AD-605 386 Div. 14, 4, 17, 30
OTS Prices: HC $7.00/MF $1.50

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
A REVIEW OF THE AIR FORCE MATERIALS RESEARCH AND DEVELOPMENT PROGRAM.
Rept. for 1 Jul 62-30 Jun 63.
Jun 64, 306p
Proj. 7381, Task 738103
WADC TR53 373, suppl. 10

Unclassified report

Descriptors: (*Air force research, Materials), (*Materials, Air Force research), (*Abstracts, Materials), Metals, Coatings, Corrosion, Mechanical properties, Phase studies, Thermal joining, Adhesives, Ceramic materials, Cermets, Composite materials, Elastomers, Fibers, Fuels, Lubricants, Fluids, Flims, Graphite, Plastics, Electrical properties, Magnetic properties, Radiation chemistry,Radiation damage, Thermodynamics, Analysis, Design, Vibration, Refractory metals, Beryllium, Plastics, Polymers, Graphite.

These reports cover basic and applied research in the materials area being conducted by the Metals and Ceramics Division, Non-Metallic Materials Division, Materials Physics Division, Manufacturing Technology Division, and Materials Applications Division of the Air Force Materials Laboratory. (Author)

AD-605 396 Div. 14, 22
OTS Prices: HC $1.00/MF $0.50

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
PLASTIC GEARS: A MEMORANDUM OF FEASIBILITY FOR USE IN AMMUNITION ITEMS,
by John Nardone. Jul 64, 44p
PLASTEC 16

Unclassified report

Descriptors: (*Plastics, Gears), (*Gears, Plastics), (*Ammunition components, Gears), Materials, Mechanical properties, Design, Molding, Acetal plastics, Nylon, Polyester plastics, Styrene plastics, Phenolic plastics, Feasibility studies, Thermoplastics.

A literature survey was performed in order to determine the plastic materials and design techniques used in gear applications, with evaluation as to feasibility for use in military items. The main plastic gear materials are: acetal, nylon, polycarbonate, modified polystyrene, and filled phenolic. The advantages in their use are numerous; however there are some limitations which must be considered in designing with plastics. Full knowledge of the properties of the contemplated material as related to the intended gear environment must be known. Plastic gear materials are suitable for ammunition items, with the specific material selection controlled by the functional and environmental conditions imposed by the item. Testing of prototypes is required in making proper evaluation of plastic gears. Two case studies have been provided as examples; one to show where plastic gears are feasible and the other to indicate an application where the design limits the use of plastic materials. (Author)

AD-605 411 Div. 14
OTS Prices: HC $3.00/MF $0.50

Purdue Univ., Lafayette, Ind.
TABLES OF THERMOPHYSICAL PROPERTIES OF MATERIALS.
Rept. for 15 Oct 62-31 Dec 63,
by Y. S. Touloukian. Jun 64, 52p
Contract AF33 657 10545, Proj. 7381, Task 738103
ML TDR64 184

Unclassified report

Descriptors: (*Materials, Thermal properties), (*Thermal properties, Tables), Gases, Liquids, Solids, Metals, Alloys, Physical properties, Thermal conductivity, Viscosity, Emissivity.

The report covers work on a continuing systematic program involving the search, collection, extraction, evaluation, correlation, interpolation, extrapolation, and the final preparation of tables of properties referred to as 'most probable' values. The report does not contain the completed data sheets, but does reproduce in the Appendix up-to-date Tables of Contents of Volumes I, II and III of the Data Books in which the loose-leaf data sheets are organized. The works reported on consist of the thermal conductivity and viscosity of gases and liquids, the thermal conductivity of metallic and nonmetallic elements, their alloys and their compounds, and the emissive properties of metals. (Author)

AD-605 412 Div. 14, 25
OTS Prices: HC $3.00/MF $0.75

Forest Products Lab., Madison, Wis.
EFFECT OF TENSILE MEAN STRESSES ON FATIGUE PROPERTIES OF PLASTIC LAMINATES REINFORCED WITH UNWOVEN GLASS FIBERS,
by Kenneth H. Boller. Jun 64, 60p
Contract AF33 657 63 358, Proj. 7381, Task 738103
ML TDR64 86

Unclassified report

Descriptors: (*Laminates, Fatigue (Mechanics)), (*Laminated plastics, Glass textiles), Epoxy plastics, Reinforcing materials, Stresses, Tensile properties, Loading (Mechanics), Laminated glass, Experimental data, Tables, Plastics, Compressive properties, Failure (Mechanics).

Fatigue curves are presented for plastic laminates reinforced with layers of unwoven 'E' glass filaments in a matrix of epoxy type resin and subjected to various alternating stress amplitudes superimposed on constant mean tensile loads. The S-N curves were determined by axially loading specimens that had alternate layers of glass at 0 degrees, ±5 degrees, ±10 degrees, and ±15 degrees to the principal axis. Curves were also determined for three special constructions of unwoven glass laminates in which: (1) 71.4 percent of the fibers were parallel to the principal axis, (2) 85.2 percent were parallel, and (3) all layers were parallel with each layer supported by a 'carrier' of 2-mil glass fabric. All experiments were conducted on unnotched specimens, at 900 cycles per minute, and in an atmosphere maintained at 73F. and 50 percent relative humidity. Loads were applied parallel to the principal axis. (Author)

AD-605 424 Div. 14, 25
OTS Prices: HC $1.00/MF $0.50

New York State Coll. of Ceramics, Alfred Univ.
THE STRESS-STRAIN BEHAVIOR OF STRONTIUM ZIRCONATE.
Bimonthly progress rept. no. 5, 15 May-15 Jul 64,
by J. E. Funk, J. Nemeth, and J. R. Tinklepaugh.
15 Jul 64, 14p
Contract NOw64 0051d

Unclassified report

ferroelectric material exhibiting a pronounced and stable threshold switching field. This fact establishes the second group of ferrielectrics in the mixed bismuth oxides with a layer-type structure. It is suggested that this new group of ferrielectrics be called 'MBO Type Ferrielectrics.' It was also revealed that this new material exhibits a stable ferrielectric state from nearly 0K up to several hundred degrees centigrade and represents, at present, a material with the widest region of stable ferroelectric behavior. The preparation of these complex crystals, as well as their morphology, is discussed. The result of electrical and optical measurements are presented and the domain structure of the crystals has been determined. Some of the semiconductive properties were studied and the effect of impurities on the threshold and bias fields is presented. A foundation for a theoretical explanation of a number of new phenomena found in ferrielectrics has been laid. (Author)

AD-605 679 Div. 14, 8
OTS Prices: HC $1.00/MF $0.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
THERMALLY CONDUCTIVE POTTING COMPOUNDS FOR 3-D WELDED ELECTRONICS,
by R. M. Jansson. 4 Jan 60, 12p E-882
Contract AF04 647 303, Proj. 52 156

Unclassified report

Descriptors: (*Sealing compounds, Modules (Electronic), (*Modules (Electronic), Sealing compounds), (*Thermal conductivity, Sealing compounds), Transistors, Encapsulation, Heat transfer, Epoxy plastics, Aluminum, Powders, Land, Magnesium compounds, Oxides, Aluminum compounds, Beryllium compounds, Silicon compounds, Zirconium compounds, Carbides, Glass, Silicates.

Internal thermal considerations for handling dense electronic modules are described. These considerations lead to the development of thermally conductive potting compounds. A concluding summary sheet presents the collected data on a number of compounds analyzed. (Author)

AD-605 681 Div. 14, 30
OTS Prices: HC $2.00/MF $0.50

Naval Ordnance Lab., White Oak, Md.
A METHOD OF TEST FOR DETERMINING THE COMPRESSIVE PROPERTIES OF FILAMENT WOUND NOL RINGS,
by S. P. Prosen. 29 Jul 64, 30p
NOL TR64 80

Unclassified report

Descriptors: (*Plastics, Filament wound construction), (*Filament wound construction, Composite materials), (*Composite materials, Filament wound construction), (*Rings, Filament wound construction), Glass textiles, Reinforcing materials, Compressive properties, Test methods, Test equipment, Pressure vessels, Underwater, Loading (Mechanics), Tensile properties, Stresses.

A mechanical fixture which can be used to determine the compressive properties of NOL rings has been developed. Use of the fixture enables the researcher to collect strength data on filament or roving wound rings, which data are important in the development of external pressure vessels. This method of test gives compressive strength and modulus values with low coefficients of variation. The data are representative of compressive strength; buckling of the ring specimens has been eliminated. As described herein, the tester can apply a maximum composite loading of 300,000 psi on a standard NOL ring configuration. (Author)

AD-605 685 Div. 14, 4
OTS Prices: HC $0.75/MF $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
DETERGENCY: MICELLAR RELATIONSHIPS OF AN ANIONIC-NONIONIC SURFACTANT MIXTURE,
by A. Mankowich. 22 May 64, 30p
Proj. 1HO 24401A110 05
CCL 163

Unclassified report

Descriptors: (*Surface-active substances, Effectiveness), (*Cleaning compounds, Effectiveness), Ions, Colloids, Electrons, Light, Scattering.

The micellar characteristics of the mixed micelles formed by three ratios of an anionic - nonionic surfactant mixture was compared with the detergencies imparted by the three combinations to aqueous alkaline cleaning solutions of ca pH 12. It was found that detergency increases with increasing charge on, and number of anionic monomers in, the mixed micelle. Improved detergency appears to be connected to a reduction in micellar dissociation. (Author)

AD-605 690 Div. 14
OTS Prices: HC $2.00/MF $0.50

IIT Research Inst., Chicago, Ill.
GRAPHITE TECHNOLOGY.
Progress rept. no. 8, 1 Jun-1 Aug 58,
by S. W. Bradstreet. 1 Aug 58, 30p
Contract AF33 616 5185, Proj. G 033

Unclassified report

Descriptors: (*Graphite, Physical properties), Binders, Pitch (Material), Carbon, Petroleum, Furan resins, Oxides, Density, Deformation, Tensile properties, Elasticity, Material forming.

The report describes the room-temperature properties of small specimens of molded multicrystalline graphite. The specimens are: a pitch-bonded petroleum coke flour 'standard' mix; several pitch-petroleum coke-thermal carbon mixes; mixes containing furfuryl alcohol as binder; and a mix in which a heavy metal oxide was substituted for part of the petroleum coke. In addition, the room-temperature properties (density, orientation factor, dynamic and static flexural moduli, ultimate flexural strength, and flexural elastic limit) were measured for a commercial, high-density (1.861 gm/cc), impregnated, molded graphite. (Author)

AD-605 732 Div. 14, 17
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
X-RAY INVESTIGATION OF DOUBLE VANADIUM-TUNGSTEN CARBIDES,
by M. A. Gurevich and B. F. Ormont. 27 Aug 64, 12p
FTD MT64 100; TT 64 71358

Unclassified report

Edited machine trans. of Metallovedenie i Termicheskaya Obrabotka Metallov (USSR) 1958, no. 1, p. 7-10.

Further study was undertaken of the feasibility of thermal nondestructive evaluation of materials (see also AD-299 230). Emphasis was on metals. A thermal testing system developed previously on the program was utilized to study material properties through the inspection of heat transfer rates. Heat introduced into the material establishes a heat transfer rate which is monitored by infrared radiometric surface temperature measurements. These temperature measurements are used to indicate certain material properties which have an effect on heat transfer. Properties detected to date are voids, inclusions, unbonding, porosity, coating thickness, alloy percentage, grain size, and lattice deformation by cold working. Theoretical studies indicated that several other properties are amenable to thermal evaluation, including phase formation, order-disorder, pre-precipitation and hardening, and corrosion. (Author)

AD-605 517 Div. 14, 25
OTS Prices: HC $2.00/MF $0.50

American Optical Co., Southbridge, Mass.
NEODYMIUM LASER GLASS IMPROVEMENT PROGRAM.
Technical summary rept. no. 4, 30 Jun 63-30 Jun 64, by Richard F. Woodcock. Sep 64, 29p
Contract Nonr3835 00, Proj. 7300; ARPA Order 306 64
Unclassified report

Rept. on Proj. DEFENDER.

Descriptors: (*Lasers, Materials), (*Neodymium, Glass), Absorption, Discoloration, Neodymium compounds, Oxides, Fluorescence, Additives.

Investigations were carried out in the following areas: (1) laser glass compositions which are non-solarizing, (2) the effect of host glass composition on fluorescent lifetime, (3) analysis of the fluorescent decay curve and (4) laser threshold studies.

AD-605 568 Div. 14
OTS Prices: HC $1.00/MF $0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
ACCELERATED WEATHERING OF PAINTS,
by Peter J. Hearst. 28 Aug 64, 13p
Proj. Y F015 06 06 902
NCEL N640
Unclassified report

Descriptors: (*Paints, Tests), Coatings, Performance (Engineering), Test equipment, Atmosphere, Ultraviolet radiation, Acceleration, Environmental tests, Simulation, Reviews.

The results of a literature search on accelerated weathering of paints for predicting the performance of coatings in atmospheric environments are presented and discussed. Present accelerated weathering tests probably would have only a limited usefulness in the prediction of performance of maintenance coatings. Suggestions for further investigations are presented. (Author)

AD-605 607 Div. 14
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SEVERAL CHARACTERISTICS OF OPTICALLY SENSITIVE MATERIALS WHICH ARE SUITABLE FOR SOLUTION OF THE VISCOUS PROBLEM OF PHOTOPLASTICITY,
by S. I. Dobrovol'skii. 22 Apr 64, 17p
FTD MT63 280; TT 64 71344
Unclassified report

Edited machine trans. of Belaruski Instytut Mekhanizatsyi Sel'skai Haspadarki. Sbornik Nauchnykh Trudov (USSR) 1959, no. 2, p. 241-249.

Descriptors: (*Optical materials, Plasticity), Organic materials, Oils, Plastics, Optical properties, Physical properties, USSR.

AD-605 616 Div. 14, 17, 25
OTS Prices: HC $1.00/MF $0.50

IIT Research Inst., Chicago, Ill.
HIGH-TEMPERATURE OXIDATION-PROTECTIVE COATINGS FOR VANADIUM-BASE ALLOYS.
Bimonthly progress rept. no. 5, 1 Jun-31 July 64, by Larry I. Kane. 1 Sep 64, 20p IITRI-B6019-5
Contract NOw64 0140c
Unclassified report

Descriptors: (*Coatings, Vanadium alloys), (*Vanadium alloys, Silicon coatings), (*Silicon coatings, Vanadium alloys), Niobium alloys, Titanium alloys, Oxidation, Protective treatments, Antioxidants, High-temperature research, Sheets, Composite materials, Tin, Silicon, Silver, Copper, Aluminum, Niobium, Tantalum alloys, Life expectancy, Mechanical properties, Ductility.

The objective of this program is the development of oxidation-protective coatings for vanadium-base alloys for use at 1800 to 2500F. The effect of pack-siliconizing on the mechanical properties of 0.020 in. thick sheet of V-60Cb-1Ti (weight per cent) is being studied. Results indicate that the siliconizing process has little effect on strength, but causes some reduction in tensile ductility. However, good ductility is noted at temperatures as low as -320F. Preliminary results indicate that there is no embrittlement of this coated sheet after twenty-five 4-hr oxidation cycles at temperatures up to 2300F. The development of an oxidation resistant slurry or liquid cementation type of coating for V-60Cb-1Ti is progressing. Slurry compositions containing tin, silicon, silver, copper, aluminum, and columbium have been investigated; several of these show good coverage, even at corners and edges. The static oxidation life of other vanadium-base alloys, coated by the pack-siliconizing process, is also being investigated. V-40Cb-30Ta-1Ti, the most promising of these alloys, has an oxidation life of about 50 hr at 2200F, and less under cyclic conditions. (Author)

AD-605 663 Div. 14, 25
OTS Prices: HC $3.00/MF $0.75

Catholic Univ. of America, Washington, D. C.
MIXED BISMUTH OXIDE (MBO) TYPE FERRIELECTRICS,
by Charles F. Pulvari. May 64, 96p
Contract AF33 657 10454, Proj. 7031, Task 703101
AL TDR64 124
Unclassified report

Descriptors: (*Ferroelectric materials, Barium compounds), (*Barium compounds, Oxides), Antiferroelectricity, Titanates, Crystal structure, Dipole moments, Heat treatment, Electrical properties, Impurities.

As a result of accumulated information, a new family of ferrielectric materials was discovered and the simplest mixed bismuth oxide with a layer-type structure, having the formula $Bi_4Ti_3O_{12}$ was found to be a degenerate anti-

reactive agents and vacuum metallizing of whiskers to promote their liquid metal infiltration. Vacuum metallizing of whiskers with chromium appears promising toward securing nichrome/alumina whisker composites where the whiskers are present in high volume content. (Author)

AD-605 845 Div. 14, 12
OTS Prices: HC $3.00/MF $0.75

Battelle Memorial Inst., Columbus, Ohio.
A STUDY OF THE INFLUENCE OF LUBRICANT ON HIGH-SPEED ROLLING-CONTACT BEARING PERFORMANCE.
Final rept.,
by Jerrold Kannel, J Clarence Bell, and C. Malcom Allen.
Sep 64, 74p
Contract AF33 657 10494, Proj. 3044, Task 304401
ASD TDR61 643 P4

Unclassified report

Descriptors: (*Lubricants, Performance (Engineering)), (*Antifriction bearings, Lubrication), Polymers, Ethers, Films, Deformation, Test equipment, X-ray diffraction analysis, Spacecraft.

Some effects of lubricants on the performance of rolling-contact elements were studied experimentally and theoretically. Circumferential profiles of the contact region of lubricated rolling-contact disks were obtained using an X-ray technique for a range of loadings, temperatures, and rolling speed with a polyphenyl ether lubricant. A method was developed for inferring the lubricant film pressures from the measured deformations, and several profiles were analyzed to yield pressure patterns. Also, a technique was developed for measuring film pressures directly using a strip of a Manganin coating on a glass disk; this disk is loaded into lubricated rolling contact with a second glass disk. The change in electrical resistance of the Manganin due to the film pressure is measured. The data recorded by these techniques appear to be fairly reproducible and consistent. (Author)

AD-605 866 Div. 14, 17, 27
OTS Prices: HC $1.00/MF $0.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS. OXIDATION-RESISTANT COATINGS FOR REFRACTORY METALS,
by J. J. English. 17 Jul 64, 4p

Unclassified report

Descriptors: (*Coatings, Refractory metals), (*Refractory metal alloys, Coatings), (*Tungsten, coatings), Niobium alloys, Tungsten alloys, Zirconium alloys, Carbon alloys, Hafnium alloys, Yttrium alloys, Molybdenum alloys, Vanadium alloys, Tantalum alloys, Ceramic coatings, Oxides, High temperature research, Rocket motor nozzles, Protective treatments, Reviews.

AD-605 910 Div. 14, 4
OTS Prices: HC $1.00/MF $0.50

Houghton (E. F.) and Co., Philadelphia, Pa.
DEVELOPMENT OF FIRE RESISTANT WATER BASED HYDRAULIC FLUIDS.
Bimonthly rept. no. 3,
by Philip Rakoff, G. John Colucci, and Robert K. Smith.
28 Sep 64, 19p
Contract NObs90269

Unclassified report

See also AD-602 745.

Descriptors: (*Hydraulic fluids, Flammability), Corrosion, Autoignition, Temperature, Boron compounds, Nitrogen compounds, Foams, Tables, Lubricant additives, Glycols.

Fire resistant, water based hydraulic fluid formulations were evaluated for autoignition temperature, lubricity, static corrosion (determined from the liquid phase corrosion test) and for pump performance using a Vickers Vane Pump. Several large batches of alkanolamine borates and glycol borate condensates were prepared for evaluation as well as a number of synthetic compounds containing boron and nitrogen. (Author)

AD-605 942 Div. 14, 4
OTS Prices: HC $3.00/MF $0.75

National Carbon Co., Lawrencesburg, Tenn.
IMPROVED GRAPHITE MATERIALS FOR HIGH-TEMPERATURE AEROSPACE USE.
Quarterly progress rept. for 1 May-31 Jul 63.
15 Aug 63, 78p
Contract AF33 657 11171
NP 14109; N63 19673

Unclassified report

Prepared in cooperation with National Carbon Co., Parma, Ohio.

Descriptors: (*Graphite, Preparation), (*Hydrocarbons, Pyrolysis), Pitch (Materials), Thermochemistry, Viscosity, Foams, Ammonia, Organic oxygen compounds, Nitrogen compounds, Oxides, Organic nitrogen compounds, Thermal expansion, Refractory materials, Refractory coatings, Silicon compounds, Carbides.

Results are reported primarily from studies on the pyrolysis mechanism of pure aromatic hydrocarbons but include some work on commerical materials, such as tars and pitches. Differential thermal analyses (DTA) on three gilsonite pitches indicated that gas evolution and increasing viscosity, rather than exothermic reactions, are responsible for foaming observed during coking studies. The increase in coking value effected by the NH2, =O, and NO2 substituents on aromatic rings is demonstrated. Stable radical intermediates were found to occur during the decomposition of a number of diazo compounds. Two methods of producing coke with high isotropic thermal expansion characteristics (in the range of most refractory carbides) are discussed. Graphite bulk densities of 1.868 g/cc made from coke produced at a pilot-scale experimental coker reported. Relative oxidation of JTA, ATJ, and SiC-coated graphite at 1600 C is presented. Results of field evaluations of promising materials are given. (Author)

AD-606 104 Div. 14, 25
OTS Prices: HC $2.00/MF $0.50

AVCO-Everett Research Lab., Everett, Mass.
INFRARED TRANSMISSION AND EMISSION OF TEFLON,
by T. Wentink, Jr. and Walter G. Planet, Jr.
Mar 60, 26p Avco-RN-195
Contract AF04 647 278
AFBMD TN60-20

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Halocarbon plastics, Infrared phenomena), Infrared spectroscopy, Absorption spectrum, Emissivity, Surface properties, Surface temperatures.

The infrared absorption spectrum of Teflon at 298K from 2 to 15 microns and the surface emission spectrum at a

Descriptors: (*Carbides, Phase studies), (*Vanadium compounds, Carbides), (*Tungsten compounds, Carbides), Cermets, X-ray photography, Solid solutions, Crystal lattices, Solubility, High-temperature research, Ceramic materials, Alloys, Metallurgy.

It is shown that at 1700--1800 the cubic carbide of vanadium VC dissolves nearly 10 mol % of the hexagonal carbide WC. At 2150--2200 the vanadium carbide VC dissolves more than 50 mol % of the tungsten carbide WC, and besides on the VC base a single-phase system will be formed--a continuous row of solid solutions with a smoothly variable period of identity from 4.16 to 4.21 kX along a very steep curve. The period of the identity c lattice of the WC phase decreases by 3--4 units in the third place after the point (the a period remains constant) as compared with pure WC. This can be explained, probably, by the very small solubility of the cubic VC carbide in the hexagonal WC carbide. (Author)

AD-605 741 Div. 14, 12, 17, 26
OTS Prices: HC $2.00/MF $0.50

New Departure Div., General Motors Corp., Bristol, Conn.
INVESTIGATION OF HIGH TEMPERATURE BEARING ELEMENTS.
Progress rept. no. 1, 1 Dec 63-31 Mar 64,
by C. J. Zupkus, H. R. Ludwig, and A. R. Leveille.
1 Apr 64, 30p
Contract AF33 615 1208, Proj. 1315, Task 131501

Unclassified report

Descriptors: (*Bearings, Materials), (*Ceramic materials, Bearings), (*Intermetallic compounds, Bearings), Test equipment, High-temperature research, Composite materials, Silicon compounds, Carbides, Aluminum compounds, Oxides, Zirconium compounds, Zirconium alloys, Boron alloys, Molybdenum compounds, Silicides, Tantalum alloys, Beryllium alloys, Thorium alloys, Nickel alloys, Tungsten alloys, Chromium alloys, Mechanical properties, Density, Melting, Transition temperature, Friction, Lubricants, Tests, Reentry vehicles.

A testing program has been developed, aimed at screening bearing materials and lubricants. The paramount objectives of this program are the establishment of specimen testing techniques and methods of data analysis. Both rolling and sliding tests will be conducted in test rigs which will operate at temperatures of -100, 1500, 2000 and 2500F. A total of eight ceramic and intermetallic materials will be initially screened. Several alternate test procedures are available in Phase II which could consider lubricants, other materials or new lots of the originally tested materials. Phase III will be a study of the selected materials when subjected to a vacuum environment and temperatures of -100, 1000 and 1500F. (Author)

AD-605 802 Div. 14, 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ANALYSIS OF CIS-BUTADIENE RUBBER BY THE INFRARED SPECTROSCOPY METHOD,
by A. P. Kastorskii and I. N. Mednikova. 26 Aug 64, 8p
FTD TT64 459; TT 64 71379

Unclassified report

Unedited rough draft trans. of Kauchuk i Rezina (USSR) 1963, v. 22, no. 3, p. 55-57.

Descriptors: (*Elastomers, Infrared spectroscopy), Synthetic rubber, Molecular structure, Chemical bonds, Analysis, Films, Preparation, USSR.

AD-605 804 Div. 14
OTS Prices: HC $7.85/MF $2.25

North Carolina State Coll., Raleigh.
RAW MATERIALS FOR REFRACTORY OXIDE CERAMICS.
Rept. for Oct 62-Jan 64,
by Hayne Palmour, III, Jerry M. Waller, R. Douglas McBrayer, Dong M. Choi, and Lawrence D. Barnes.
Jul 64, 484p
Contracts AF33 616 6288, AF33 657 8741,
Projs. 7381, 920, Task 738103
ML TDR64 110

Unclassified report

Subcontract to Ohio State Univ. Research Foundation, Columbus.

Descriptors: (*Oxides, Ceramic materials), (*Ceramic materials, Data), (*Refractory materials, Oxides), Physical properties, Aluminum compounds, Barium compounds, Beryllium compounds, Calcium compounds, Cerium compounds, Chroumium compounds, Cobalt compounds, Dysprosium compounds, Europium compounds, Sadolinium compounds, Gallium compounds, Hafnium compounds, Lanthanum compounds, Lithium compounds, Magnesium compounds, Manganese compounds, Neodymium compounds, Nickel compounds, Niobium compounds, Samarium compounds, Silicon compounds, Strontium compounds, Tantalum compounds, Thorium compounds, Tin compounds, Titanium compounds, Uranium compounds, Vanadium compounds, Yttrium compounds, Zinc compounds, Zirconium compounds, Chemical properties.

Based on voluntary responses to a detailed survey of commercial suppliers, the report indicates statistically the character of raw materials for refractory oxide ceramics which are currently available. Of principal interest is the detailed description of 410 individual raw materials and their significant chemical, physical, and particulate properties; they include 39 oxide systems, and are commercially available from 67 different supplier organizations.

AD-605 839 Div. 14, 17
OTS Prices: HC $2.00/MF $0.50

Horizons, Inc., Cleveland, Ohio.
REINFORCEMENT OF NICKEL CHROMIUM ALLOYS WITH SAPPHIRE WHISKERS.
Interim rept. no. 3, 29 Apr-28 Jul 64,
by Richard W. Sicka and Mark S. Vukasovich.
1 Sep 64, 38p
Contract NOw64 0125c

Unclassified report

Descriptors: (*Metals, Composite materials), (*Composite materials, Ceramic fibers), (*Ceramic fibers, Reinforcing materials), (*Sapphires, Ceramic fibers), Single crystals, Refractory metals, Refractory metal alloys, Aluminum compounds, Titanium compounds, Zirconium compounds, Hydrides, Additives, Nickel alloys, Chromium alloys, Fiber metallurgy, Anisotropy, Iron compounds, Encapsulation, Vacuum apparatus, Density, Metal coatings, Surface tension.

Studies have continued toward elucidating means whereby high volume percent alpha alumina whiskers loadings can be incorporated into refractory metal matrices to yield high strength composite structures. These studies used titanium and zirconium hydrides as sources of oxide

and heat treatment for these materials was established. In addition, various methods were tried for fabricating the more complex structures. It was concluded that the best system currently available is a glass filled Phenolic plastic protected with an Inconel honeycomb reinforced Zirconia insulator faced with a plasma sprayed Zirconia surface. This structure was fabricated into a small expansion cone in a configuration suitable for testing on a solid fuel rocket. (Author)

AD-606 147 Div. 14, 4
OTS Prices: HC $1.00/MF $0.50

General Technologies Corp., Alexanderia, Va.
A STUDY OF HIGH MODULUS, HIGH STRENGTH FILAMENT MATERIALS BY DEPOSITION TECHNIQUES.
Bi-monthly progress rept. no. 5, 1 Jul-31 Aug 64,
by L. G. Davies, J. C. Withers, and D. F. Bazzarre.
15 Sep 64, 14p
Contract NOw64 0176c

Unclassified report

See also AD-603 403.

Descriptors: (*Filaments, Manufacturing methods), (*Reinforcing materials, Filaments), Beryllium, Beryllium compounds, Oxides, Chlorides, Hydrogen, Reduction (Chemistry), Carbon dioxide, Tensile properties, Composite materials, Vapor plating, Density.

Beryllium and beryllium oxide were successfully produced during this period. The beryllium filaments were produced by the hydrogen reduction of $BeCl_2$, and the beryllium oxide filaments were formed by reacting $BeCl_2$ with CO_2. The tensile strength of the beryllium filaments ranged up to 246 x 1000 psi, and the beryllium oxide filaments ranged up to 96 x 1000 psi. (Author)

minimum temperature of 700K from 2.7 to 6.0 microns are reported. Corresponding absorption coefficients and emissivity are discussed. The emissivity varies with wavelength in accordance with the absorption, as expected, so that assignment of a color temperature or description of the hot surface as a grey body are not valid. (Author)

AD-606 107 Div. 14, 8
OTS Prices: HC $5.00/MF $1.25

General Dynamics/Convair, San Diego, Calif.
STUDY OF THERMAL INSULATING MATERIALS.
VOLUME I. MATERIALS RESEARCH.
Final engineering rept.,
by D. R. Walin. 29 Feb 60, 200p TG-208
Contract NOas58 853c

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Electronic equipment, Airborne), (*Thermal insulation, Electronic equipment), (*Materials, Thermal insulation), (*Composite materials, Thermal insulation), Electronic equipment, Airborne, Plastics, Laminated plastics, Expanded plastics, Honeycomb cores, Sandwich construction, Processing, Molding, Molding materials, Thermal conductivity, Density, Experimental data, Specific heat, Thermal diffusion, Absorption, Flammability, Accoustic properties, Fibers, Ceramic materials, Glass textiles, Refection, Aluminum, Tapes, Metal coatings, Metal films, Foils, Gold.

A comprehensive study is made of insulating materials for application as a thermal barrier structurally adequate for housings of airborne electronic equipment. A combination of thermal insulating and reflective materials will be optimum and the required properties of the combination will be dependent upon the cooling method, the equipment temperature limitations and cooling effectiveness, and the thermal environment provided by the aircraft. Tables are given listing the materials and their properties. The tables should be expanded and kept up to date. Plastic materials in general, and specifically plastic laminates in combination with plastic foams or honeycomb cells filled with a low density insulant appear to be the most suitable group of thermal insulating materials for this application. The properties have not been determined for any of the many material combinations and emphasis should be placed on research and development in this area. Expect for thermal and to a lesser extent mechanical properties, the properties of the tabulated materials are not readily available, and should be determined. In some cases a common standard for the property is needed. Fabrication techniques effect material properties and should be studied to minimize adverse effects. (Author)

AD-606 120 Div. 14, 26
OTS Prices: HC $1.00/MF $0.50

Uxbridge, Div. of Indian Head Mills, Inc., Cedartown, Ga.
DEVELOPMENT OF SHADE STANDARDS AND SHADE TOLERANCES, WOOL/POLYESTER CLOTH, SHADE BLUE 1084, TYPE 111.
Rept. for Aug 63-Jun 64.
Jun 64, 20p
Contract AF33 657 12357, Proj. 6314, Task 631403
SEG TDR64 41

Unclassified report

Descriptors: (*Textiles, Colors), (*Woolen textiles, Colors), (*Polyester plastics, Textiles), Dyes, Standards, Blankets, Manufacturing methods.

The purpose of this project is to provide shade standards and tolerances in shade Blue 1084, Cloth, Wool/Polyester, Type III, of Specification MIL-C-21115B. Nine different lots of top were dyed, blended and combed. The same base components were used in all nine lots. Small percentages of colored wool were used to throw the shades to the 'full red', 'thin green,' etc. These nine different lots were processed into yarn and woven into 'blankets' so that each of the nine lots were used as warp and each of the nine lots were also used as filling. The yarn count and fabric construction of the blankets was standard for fabric of this type. The blanket fabric was finished and submitted to the contractor and approved. Contract quantities were then processed exactly the same as the blankets. (Author)

AD-606 128 Div. 14
OTS Prices: HC $3.00/MF $0.75

IIT Research Inst., Chicago, Ill.
INVESTIGATION OF GRAPHITE BODIES.
Progress rept. no. 4, 1 Jun-31 Aug 59,
by S. W. Bradstreet. 1 Sep 59, 65p IITRI-6039-4
Contract AF33 616 6143

Unclassified report

Descriptors: (*Graphite, Physical properties), Refractory materials, Petroleum, Carbon, Binders, Pitch (Material), Furan resins, Density, X-ray diffraction analysis, Mechanical properties, Resistance (Electrical), Thermosetting resins, Analysis.

Preliminary data are presented illustrating the properties of molded multicrystalline graphite made using calcined petroleum coke (in some instances mixed with a thermal carbon) bonded with coal tar pitch, furfuryl alcohol, or limited mixtures of the two. No conclusions have yet been drawn regarding the relation between these properties, since a large number of specimens remain to be measured. Most obvious is the difficulty of achieving a sound structure from bodies of maximum green density, particularly when the binder is not thermoplastic. Graphitized specimens made with furfuryl alcohol reflect the high density of the binder coke. X-ray data show that this coke is poorly graphitizable as compared to pitch; modulus and electrical resistance data show it to be more dense. A full description of the use of differential thermal analysis and dilatometry in investigating the behavior of thermosetting resins is appended. (Author)

AD-606 135 Div. 14, 12
OTS Prices: HC $3.00/MF $0.75

Bendix Products Div., Bendix Corp., South Bend, Ind.
THERMAL PROTECTIVE SURFACES FOR STRUCTURAL PLASTICS.
Quarterly progress rept. no. 3, 1 Feb-30 Apr 60,
by James W. Vogan. May 60, 59p
Contract AF33 616 6393, Proj. 7340, Task 73402

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction will be made from best available copy.
See also: AD-260 209.

Descriptors: (*Plastics, Thermal insulation), (*Ceramic coatings, Plastics), (*Thermal insulation, Composite materials), (*Composite materials, Thermal insulation), (*Zirconium compounds, Oxides), Erosion, Heat treatment, Phenolic plastics, Honeycomb cores, Glass, Nickel, Reinforcing materials, Heat-resistant materials, Thermal properties, Ceramic materials, Protective treatments, Metal coatings, Graphite, Solid fuel rockets, Refractory coatings.

An investigation was carried out on the effect of processing variables for the Zirconia based insulating and erosion resistant layers. The required compacting pressures

Descriptors: (*Potential theory, Bessel functions), (*Bessel functions, Potential theory), (*Functional analysis, Set theory), Convex sets, Topology, Measure theory, Complex numbers, Transformations (Mathematics), Integrals, Matrix algebra, Corrections.

AD-605 362 Div. 15
OTS Prices: HC $3.00/MF $0.75

Numerical Analysis Research, Univ. of California, Los Angeles.
DISCRETIZATION METHODS FOR RETARDED ORDINARY DIFFERENTIAL EQUATIONS,
Doctoral thesis,
by Morley Alan Feldstein. Aug 64, 68p
Grants DA ARO D31 124G77, DA ARO D31 124G570
Unclassified report

Descriptors: (*Differential equations, Numerical analysis), (*Numerical analysis, Differential equations), Theorems, Inequalities, Series, Perturbation theory, Sequences, Integrals, Boundary value problems, Numerical methods and procedures.

Let alpha(x) be a continuous real function satisfying a < alpha(x) < x < b. Let y(a) = y sub o, a given real number. Then the retarded ordinary differential equation y'(x) = f(x, y(x), y(alpha(x)) has a unique local solution y(x) provided that f is continuous in its first argument and satisfies a Lip sub 1 condition in its other arguments. The purpose of this paper is to investigate constructive methods for solving this initial value problem. The discrete variable approach is used. Chapter 1 introduces a first order one step algorithm, shows that under suitable hypotheses it converges uniformly on finite intervals to the unique solution y(x), and shows that the discretization error is bounded. (The bound, while a function of f, is independent of alpha.) (Author)

AD-605 381 Div. 15
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
ON CERTAIN PROCEDURES OF THE RUNGE-KUTTA TYPE FOR THE NUMERICAL INTEGRATION OF THE DIFFERENTIAL EQUATION y' = f(x,y),
by A. Cotiu and F. Cotiu. 10 Aug 64, 12p
RSIC 243; TT 64 71301
Unclassified report

Trans. of Cluj Univ. Studia Universitatis Babes -Bolyai. Series 1: Mathematica, Fizica, Chimie (Rumania) 1961, v. 6, no. 1, p. 175-162. Communication presented to the Scientific Session of the Babes-Bolyai University, 21-23 Apr 60.

Descriptors: (*Differential equations, Integration), (*Integration, Differential equations), (*Numerical methods and procedures, Integration), Integrals, Functions, Series, Inequalities, Transformations (Mathematics), Numerical analysis, Rumania.

AD-605 382 Div. 15
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
A PROCEDURE OF THE EIGHTH ORDER OF ACCURACY FOR THE NUMERICAL INTEGRATION OF FIRST ORDER DIFFERENTIAL EQUATIONS,
by A. Cotiu. 20 Aug 64, 20p
RSIC 248; TT 64 71302 Unclassified report

Trans. of Academia Republicii Populare Romine. Filiala Cluj. Studii si Cercetari de Matematica, 1961, v. 12, no. 1, p. 29-40.

Descriptors: (*Differential equations, Integration), (*Integration, Differential equations), (*Numerical methods and procedures, Integration), Integrals, Functions, Series, Transformations (Mathematics), Partial differential equations, Numerical analysis, Rumania.

AD-605 383 Div. 15
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
ON SOME EXTENSIONS OF A FEHLBERG TRANSFORMATION,
by A. Cotiu. 20 Aug 64, 18p
RSIC 249; TT 64 71303
Unclassified report

Trans. of Institutul Politehnic, Cluj. Buletinul Stiintific (Rumania) 1961, v. 4, p. 45-54.

Descriptors: (*Transformations (Mathematics), Differential equations), (*Differential equations, Transformations (Mathematics)), (*Numerical methods and procedures, Integration), Integrals, Series, Functions, Taylor's series, Numerical analysis, Rumania.

This paper gives a class of procedures of the fourth order of accuracy, a fifth order procedure and a class of procedures of the sixth order of accuracy for numerically integrating differential equations of the first order. For these, there are used two extensions of a transformation given by E. Fehlberg which must be made on the differential equation. The application of those procedures requires a minimum number of substitutions in the transformed differential equation. Thus, for applying procedures of the fourth and fifth orders of accuracy, a single substitution is necessary, and for applying procedures of the sixth order of accuracy, two substitutions in the transformed differential equation are required.

AD-605 404 Div. 15, 2, 9
OTS Prices: HC $6.00/MF $1.25

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
HERALD OF THE LENINGRAD UNIVERSITY, 1963, VOL. 18, NO. 7, MATHEMATICS, MECHANICS, AND ASTRONOMY SERIES NO. 2.
28 Jul 64, 210p
FTD MT64 63,; TT 64 71305
Unclassified report

Edited machine trans. of Leningrad U. Vestnik (USSR) 1963, v. 18, no. 7, Seriya Matematiki, Mekhaniki, i Astronomii, no. 2, p. 1-160. Legibility of this document is in part unsatisfactory; reproduction has been made from best available copy.

Descriptors: (*Mathematics, Periodicals), (*Mechanics, Periodicals), (*Astronomy, Periodicals), (*Periodicals, USSR), Convex sets, Geometric forms, Functional analysis, Calculus of variations, Functions, Series, Fourier analysis, Electromagnetic waves, Scattering, Operators (Mathematics), Complex variables, Compressible flow, Turbulence, Probability, Marine meteorology, Integral equations, Kinetic theory, Gases, Supersonic flow, Bodies of revolution, Laminar boundary layer, Incompressible flow, Elasticity, Theory, Solar spectrum.

15. Mathematics

AD-605 128 Div. 15
OTS Prices: HC $1.00/MF $0.50

Institute of Statistics, Univ. of Georgia, Athens.
ESTIMATION IN MIXTURES OF DISCRETE DISTRIBUTIONS.
Technical rept. no. 12,
by A. Clifford Cohen, Jr. 15 Aug 63, 8p
Grant DA ARO D31 124G55, Proj. 20011501B704
AROD 2773 8; N63 23426
Unclassified report

Descriptors: (*Sampling, Statistical distributions), (*Statistical distributions, Sampling), Binomials, Statistical analysis, Probability, Statistical functions, Combinatorial analysis.

In this paper, parameters of mixed distributions are estimated using sample moments and sample zero frequencies. Mixtures consisting of two complete Poisson distributions, two truncated Poisson distributions, and a Poission combined with a binomial distribution are considered. (Author)

AD-605 130 Div. 15, 26
OTS Prices: HC $4.00/MF $0.75

Columbia Univ., New York
APPLICATION OF BALLOT THEOREMS IN THE THEORY OF QUEUES,
by Lajos Takacs. 17 Aug 64, 108p CU-45-64
Contract Nonr266 59, Proj. NR042 205
Unclassified report

Descriptors: (*Probability, Queueing theory), (*Queueing theory, Probability), (*Stochastic processes, Queueing theory), Theorems, Distribution theory, Time studies, Operations research, Optimization, Statistical processes, Management engineering, Combinatorial analysis, Transformations (Mathematics).

By using a discrete and a continuous generalization of the classical ballot theorem the author finds the distribution of the supremum for partial sums of some interchangeable random variables taking on integer values and the distribution of the supremum for some stochastic processes having interchangeable increments. The results obtained are applied to some single-server queues in order to find the stochastic law of the fluctuations of the queue size and that of the waiting time. (Author)

AD-605 171 Div. 15
OTS Prices: HC $2.00/MF $0.50

California Univ., Berkeley.
ON THE PROBLEM OF NORMAL FORMS FOR A SYSTEM OF ORDINARY DIFFERENTIAL EQUATIONS AT A SINGULAR POINT,
by Richard Venti. Aug 64, 48p
Contract Nonr222 88
Unclassified report

Descriptors: (*Differential equations, Transformations (Mathematics)), Real numbers, Matrix algebra, Polynomials, Functions, Topology, Theorems, Mathematical logic.

AD-605 251 Div. 15, 2
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
CHANDRASEKHAR'S X- AND Y- FUNCTIONS,
by J. L. Carlstedt and T. W. Mullikin. Aug 64, 46p
RM-4113-PR
Contract AF49 638 700
Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Functions, Integral equations), (*Integral equations, Functions), (*Atmosphere, Wave transmission), Electromagnetic waves, Scattering, Optical properties, Complex variables.

A description is given of the results of the application of singular integral equation theory to Chandrasekhar's X- and Y-functions. Both exact and asymptotic formulae are given for the unique functions which are analytic functions of their argument. Computations are reduced to the solution of rapidly convergent Fredholm equations and to the calculation of various quadratures. Numerical tables for the case of isotropic scattering will be published as a supplement to the Astrophysical Journal. (Author)

AD-605 291 Div. 15
OTS Prices: HC $3.00/MF $0.75

Case Inst. of Tech., Cleveland, Ohio.
HIERARCHIES OF GENERAL RECURSIVE FUNCTIONS AND ORDINAL RECURSION.
Technical rept. no. 2,
by Robert S. Fabian. Aug 64, 86p Case-204
Grants Nonr G00077 64, Nonr G00038 63
Unclassified report

Descriptors: (*Recursive functions, Mathematical logic), (*Mathematical logic, Recursive functions), Set theory, Numbers, Iterative methods, Functions, Theorems.

The purpose of this work was to examine several ways of imposing partial orderings on various classes of general recursive functions. The objective of these partial orderings, or hierarchies, is to obtain some indication of 'difficulty of computation' of the ordered recursive functions. The problem is approached from two points of view. First, the authors consider the known partial orderings of the primitive recursive and general recursive functions using the methods of Grzegorczyk and Kleene, respectively. Second, using an iteration technique the authors impose a total ordering on classes of general recursive functions obtained by closing a fixed set of initial functions under all applications of substitution, primitive recursion and a finite number of general recursive functionals.

AD-605 333 Div. 15
OTS Prices: HC $5.00/MF $1.00

Kansas Univ., Lawrence.
THEORY OF BESSEL POTENTIALS. Part II. REVISED VERSION.
Technical rept. no. 8 (new series)
by R. Adams, N. Aronszajn, and K. T. Smith. Jul 64, 153p
Contract Nonr583 13, Proj. NRO43 066
Unclassified report

The first version of this paper issued as Technical rept. no. 26.

asymptotic form of the mean total reward in (O, t) has previously been obtained, and it is known that the total rewards are joint-normally distributed as t approaches infinity. This paper finds the dominant asymptotic term in the covariance of the total rewards as a simple function of the moments of the per-transition rewards, and the 'bias' term of the mean total rewards. Special formulas for the dominant covariance term of 'number of visits', and 'occupation time' in given states are also derived. (Author)

AD-605 507 Div. 15
OTS Prices: HC $1.00/MF $0.50

Technische Hochschule, Munich (West Germany).
EXPERIMENTAL RESULTS ON THE METHOD OF 'NEBENCHARAKTERISTIKEN'.
Scientific rept. no. 1,
by Wolfgang Werner. 15 Jun 64, 16p THM-6408
Grant AF EOAR63 77
AFOSR 64 1604
Unclassified report

Descriptors: (*Partial differential equations, Integration), (*Numerical method and procedures, Integration), Differential equations, Conical bodies, Invariance, Programming (Computers).

Systems of hyperbolic partial differential equations in 2 or more space variables are integrated numerically by taking derivatives in 'characteristic hyperplanes'. Numerical results are presented and discussed. (Author)

AD-605 549 Div. 15
OTS Prices: HC $3.00/MF $0.75

Operations Research Center, Univ. of California, Berkeley.
NONLINEAR PROGRAMS WITH POSITIVELY BOUNDED JACOBIANS,
by Richard W. Cottle. 22 Jun 64, 60p ORC-64-12(RR)
Contract Nonr222 83, Grant GP2633
Unclassified report

Descriptors: (*Nonlinear programming, Matrix algebra), (*Matrix algebra, Nonlinear programming), Mathematical programming, Operations research, Optimization, Functions, Theorems, Linear programming, Quadratic programming.

This report is concerned with properties and solution methods for inequality-constrained extremization problems. Generally, the problems can be put as follows: 'minimize f sub 0(x) constrained by f sub i(x) <0, 1 < i < m, where the f sub i(0 < i < m) are real-valued functions defined on real n-space.

AD-605 553 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
QUASILINEARIZATION, BOUNDARY-VALUE PROBLEMS AND LINEAR PROGRAMMING,
by R. E. Bellman, H. H. Kagiwada, and R. E. Kalaba.
Sep 64, 10p RM-4284-PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Boundary value problems, Linear programming), (*Linear programming, Boundary value problems), (*Nonlinear differential equations, Numerical analysis), Iterative methods, Calculus of variations, Inequalities, Mathematical programming.

In this note is is shown that the problem of minimizing the maximum deviation can be solved using the quasi-linearization format and employing linear programming at each stage of the calculation. In the case where the observational errors are all of approximately the same magnitude, or are all of the same relative magnitudes, this procedure seems to have substantial advantages over the method of least squares. (Author)

AD-605 554 Div. 15, 16, 26
OTS Prices: HC $1.00/MF $0.50

Florida State Univ., Tallahassee.
TWO SEQUENTIAL TWO-SAMPLE GROUND RANK TESTS WITH APPLICATION TO SCREENING EXPERIMENTS.
Technical rept. no. 11,
by Frank Wilcoxon and Ralph A. Bradley. Jan 64, 8p
Contract Nonr988 08, Proj. NR042 004
Unclassified report

Rept. on The Development of Statistical Methods for Quality Control and Surveillance Testing. Subjective Testing and Quality Evaluation.

Descriptors: (*Statistical tests, Sequential analysis), Probability, Sequences, Statistical processes, Quality control, Medical research, Rats, Ulcers, Statistical analysis.

AD-605 555 Div. 15, 26
OTS Prices: HC $1.00/MF $0.50

Florida State Univ., Tallahassee.
THE DISTRIBUTION OF WAITING TIME IN A MACHINE INTERFERENCE PROBLEM.
Technical rept. no. 12,
by Vincent Hodgson. May 64, 14p
Contract Nonr988 08, Proj. NR042 004
Unclassified report

Rept. on The Development of Statistical Methods for Quality Control and Surveillance Testing. Research partly supported by the Army and the Air Force.

Descriptors: (*Machines, Maintenance), (*Time studies, Maintenance), (*Queueing theory, Maintenance), Statistical distributions, Statistical functions, Statistical processes, Quality control, Mathematical models, Probability, Operations research.

This paper considers the probabilistic behavior of a system consisting of one man who repairs a set of m machines one at a time in the order in which they break down. The usual assumption was made of exponentially distributed working time for each machine. Interest centers on the distribution of the length of time a machine is broken down between its working times. Methods and results are a little simpler than those of Takacs. In particular a new expression was found for the probability density function of waiting time in the case of exponentially distributed repair times. The definition given of waiting time is not the usual one. (Author)

AD-605 556 Div. 15, 26, 32
OTS Prices: HC $2.00/MF $0.50

Florida State Univ., Tallahassee.
MULTIVARIATE ANALYSIS; I. GENERAL.
Technical rept. no. 13 (Statistics rept.),

Contents: Regular-faced polyhedrons, On differential properties of bounded generalized solutions of quasi-linear systems of the variational type, Several results on the properties of functions which are defined by trigonometric series with monotonic decreasing coefficients, Investigation of the problem of scattering in certain infinite regions, On extremal regions connected with one-sheeted functions, Turbulent boundary layer of a non-thermoinsulated wing or axially symmetric body in a compressible liquid, On the approximate probability analysis of structure of wind velocity above the sea.

AD-605 406 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF HAMILTON: JOCOBI IN VARIATION PROBLEMS WITH PARTIAL DERIVATIVES,
by K. A. Lur'e. 4 Sep 64, 18p
FTD MT64 224; TT 64 71307

Unclassified report

Edited machine trans. of Prikladnaya Matematika i Mekhanika (USSR) 1963, v. 27, no. 2, p. 255-264.

Descriptors: (*Calculus of variations, Partial differential equations), (*Partial differential equations, Calculus of variations), Integration, Functions, Complex variables, Boundary value problems, Integrals, USSR.

AD-605 451 Div. 15, 12
OTS Prices: HC $1.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
SUBOPTIMAL LINEAR FILTERING FOR CONTINUOUS DYNAMIC PROCESSES,
by James S. Meditch. 15 Jul 64, 25p
TOR-469(5107-35)-2
Contract AF04 695 469

Unclassified report

Descriptors: (*Differential equations, Matrix algebra), (*Least squares method, Optimization), Linear systems, Dynamics, Satellites (Artifical), Orbital trajectories.

A theory of suboptimal linear filtering is developed for continuous dynamic processes. The method consists in partitioning the process state vector into two or more parts and designing separate filters for each part. A suboptimal estimate of the process state vector is then obtained by a suitable combination of the separate filter outputs. The central result of the study is the derivation of a linear, first-order matrix differential suboptimal estimate. This result provides a straightforward means of comparing suboptimal with optimal performance. An example for a second-order process is presented to illustrate the technique, and a comparison with optimal performance is given. (Author)

AD-605 496 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
DYNAMIC PROGRAMMING, LEARNING, AND ADAPTIVE PROCESSES,
by Richard Bellman. Sep 64, 15p RM-3777-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Dynamic programming, Adaptive control systems), (*Decision making, Dynamic programming), (*Learning, Dynamic programming), Differential equations, Stochastic processes, Feedback, Optimization, Probability.

The intensive study in recent years of a variety of descriptive and variational processes, such as those which arise in biology, psychology, engineering, and economics, has uncovered many problems which are too complex to be solved by classical mathematical techniques. In order to describe some of the difficulties involved, the essentials of the classical approach for dealing with processes of this sort, in which there is insufficient information about the state variables, are reviewed. Some of the ways in which dynamic programming and adaptive control may be used to bridge the gap between classical and modern theories are indicated. Problems encountered in the study of adaptive processes are discussed and some directions for future research are suggested. (Author)

AD-605 499 Div. 15
OTS Prices: HC $1.00/MF $0.50

Operations Research Center, Univ. of California, Berkeley.
PROGRAMMING UNDER UNCERTAINTY WITH DISCRETE D. F.,
by Mostafa El-Agizy. 22 Jul 64, 20p
ORC-64-13-RR
Contract Nonr222 83

Unclassified report

Descriptors: (*Linear programming, Stochastic processes), (*Stochastic processes, Linear programming), Optimization, Operations research, Transportation, Inventory, Production, Scheduling, Statistical functions.

Many realistic situations can be represented by the two-stage linear programming problem under uncertainty. Two special cases, that fit in this formulation, are discussed to expose their interesting features: (1) a transportation problem (2) a production-inventory problem. Many other examples are available in the literature. For the stochastic transportation problem it is shown that the corresponding deterministic equivalent program represents a directed network. For the production-inventory problem, since the matrix B = I, the demand constraints disappear in the equivalent program, thus the number of constraints is reduced to a minimum; namely, the fixed constraints.

AD-605 500 Div. 15
OTS Prices: HC $1.00/MF $0.50

Operations Research Center, Univ. of California, Berkeley.
LIMITING COVARIANCE IN MARKOV-RENEWAL PROCESSES,
by William S. Jewell. 22 Jul 64, 22p
ORC-64-16RR
Contract Nonr222 83

Unclassified report

Descriptors: (*Statistical processes, Probability), Analysis of variance, Measure theory, Statistical functions, Statistical analysis.

General additive functions called rewards are defined on a 'regular' finite-state Markov-renewal process. The

Edited machine trans. of Matematicheskii Sbornik (USSR) 1963, v. 60(102) no. 4, p. 393-410.

Descriptors: (*Differential equations, Integrals), (*Integrals, Differential equations), Complex numbers, Integration, Inequalities, Boundary value problems, Functions, Potential theory, USSR.

AD-605 606 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOLUTION OF THREE PROBLEMS IN THE LATTICE THEORY,
by S. A. Kogan. 17 Apr 64, 13p
FTD MT63 318; TT 64 71343
Unclassified report

Edited machine trans. of Uspekhi Matematicheskikh Nauk (USSR) 1956, v. 11, no. 2(68) p. 185-190.

Descriptors: (*Algebra, Theorems), (*Algebraic topology, Set theory), Topology, USSR.

AD-605 620 Div. 15
OTS Prices: HC $5.00/MF $1.00

Illinois Univ., Urbana.
PRIMES GENERATED BY POLYNOMIALS IN ONE VARIABLE,
by Peter Bradley Russell. 1964, 167p
Contract Nonr1834 18, Proj. NR043 194
Unclassified report

Descriptors: (*Number theory, Polynomials), (*Polynomials, Number theory), (*Prime numbers, Polynomials), Integers, Real numbers, Complex numbers, Equations, Numerical methods and procedures.

The classic problem in the theory of the distribution of primes is considered. The purpose of this paper is to obtain upper bounds in problems involving the distribution of primes.

AD-605 621 Div. 15
OTS Prices: HC $2.00/MF $0.50

Columbia Univ., New York.
OCCUPATION TIME PROBLEMS IN THE THEORY OF QUEUES,
by Lajos Takács. 15 Apr 64, 31p
CU-44-64-Nonr-266(59)MS
Contract Nonr266 59, Proj. NR042 205
Unclassified report

Descriptors: (*Queueing theory, Time), Scheduling, Distribution theory, Analysis of variance, Probability, Dams, Fluid flow, Statistical functions, Stochastic processes.

Consideration is given to a single-server queue and deals with the problem of finding the distribution of the total occupation time of the server in the time interval (O,t) and the distribution of the number of services among the first n services that are not preceded by an idle period. The use of the results in the theory of dams is mentioned. (Author)

AD-605 632 Div. 15, 16
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
LINEAR PROGRAMMING,
by Richard C. Kao. Jan 62, 16p P-2514
Unclassified report

Descriptors: (*Linear programming, Diet), Optimization, Nutrition, Linear systems, Inequalities, Set theory, Operations research.

The optimal diet problem is solved using the method of linear programming. A general discussion and suggested fields of application of linear programming are included.

AD-605 636 Div. 15, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ON HASEN'S METHOD FOR COMPUTING SPECIAL PERTURBATIONS,
by W. T. Kyner. 19 Aug 59, 14p
STL-TR-59-0000-00816
Unclassified report

Descriptors: (*Differential equations, Motion), (*Satellites (Artificial), Motion), (*Perturbation theory, Orbital trajectories), Dynamics, Elliptical orbit trajectories, Moment of inertia, Space navigation, Rotation, Vector analysis.

The purpose of this paper was to derive a set of differential equations which describe the motion of a satellite moving in a nearly elliptical orbit around the earth. The derivation presented is a modification of that given by Peter Musen in his paper 'Modified formulae for Hansen's special perturbations.' Hansen's method describes the motion of the satellite relative to a fixed auxiliary ellipse in the instantaneous orbit plane. At the same time, the position of the ellipse relative to an inertial coordinate system is determined. Two sets of differential equations are derived. The first, which is similar to that given by Musen, uses an auxiliary ellipse which is not permitted to rotate in the orbit plane. It is suitable for orbits with small eccentricity. The second uses an auxiliary ellipse rotating in the plane so that its axes are coincident with the axes of instantaneous ellipse which is associated with the motion. Its set of equations is similar to that of the variation of the elements method. However 'One point which differentiates Hansen's method from all others consists in the addition of the perturbations directly to the mean anomaly of a certain auxiliary ellipse in the plane of the instantaneous orbit instead of to the true anomaly or to the true longitude on the fixed plane.'

AD-605 638 Div. 15, 20
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
LIMITING BEHAVIOR FOR AGE AND POSITION-DEPENDENT BRANCHING PROCESSES.
Technical summary rept.,
by Howard E. Conner. Jun 64, 48p MRC-TSR-481
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Mathematical models, Stochastic processes), (*Stochastic processes, Nuclear particles), Neutron age, Probability, Functions, Equations, Diffusion.

In this paper a model is studied for the population transition probabilities for a branching process composed of particles diffusing in a finite interval. The model is in general non-Markovian assuming the branching transformation probabilities for a particle depend on its age and position. The process is described by the random number N sub t (x) of particles in the interval I at time

by Ralph A. Bradley. Aug 64, 30p FSU-M-47
Contract Nonr988 08, Proj. NR042 004
Unclassified report

Rept. on The Development of Statistical Methods for Quality Control and Surveillance Testing.

Descriptors: (*Statistical analysis, Theory), Statistical distributions, Statistical processes, Sampling, Analysis of variance, Correlation techniques, Factor analysis, Statistical functions, Quality control, Probability.

AD-605 557 Div. 15, 26
OTS Prices: HC $1.00/MF $0.50

Florida State Univ., Tallahassee.
ANOTHER INTERPRETATION OF A MODEL FOR PAIRED COMPARISONS.
Technical rept. no. 14 (Statistics rept.),
by Ralph A. Bradley. Aug 64, 8p FSU-M-50
Contract Nonr988 08, Proj. NR042 004
Unclassified report

Rept. on The Development of Statistical Methods for Quality Control and Surveillance Testing.

Descriptors: (*Mathematical models, Stochastic processes), (*Stochastic processes, Mathematical models), Statistical functions, Statistical tests, Statistical processes, Quality control.

The first effect of this paper is to demonstrate that the paired comparisons model may be derived from a variety of different initial assumptions about the nature of paired comparisons, some of these assumptions appearing to be more appropriate to a description of the preference-decision process than others. The second effect of this paper is to note that the generalization of the model to triple comparisons chosen earlier is not the one compatible with the Lehmann model even though it seems to possess other desirable properties. Limited numerical calculations suggest that both models for triple comparisons give comparable results in applications and their asymptotic properties should be similar. (Author)

AD-605 588 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOME QUESTIONS CONNECTED WITH THE QUADRATIC COMPLEX,
by V. A. Manevich. 16 Apr 64, 7p
FTD MT63 309; TT 64 71334
Unclassified report

Edited machine trans. of Nauchnye Doklady Vysshei Shkoly. Fiziko-matematicheskie Nauki (USSR) 1958, no. 5, p. 38-39.

Descriptors: (*Differential geometry, Theorems), Geometry, USSR.

One method of construction of tetrahedral (quadratic) complex is given and two theorems connected with the quadratic complex are proven.

AD-605 589 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ONE THEOREM ON SERIES FOR POLYNOMIALS,
by T. I. Krasnoshchekov. 17 Apr 64, 10p
FTD MT63 324; TT 64 71335
Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Doklady, 1951, v. 77, no. 5, p. 787-789.

Descriptors: (*Polynomials, Series), (*Series, Polynomials), Theorems, Functions, Numerical methods and procedures, USSR.

AD-605 601 Div. 15, 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DYNAMICS OF CONTINUOUS AUTOMATIC OPTIMIZERS FOR ONE CLASS OF SYSTEMS,
by A. A. Belen'kii and A. B. Chelyustkin. 9 Mar 64, 25p
FTD MT64 34; TT 64 71338
Unclassified report

Edited machine trans. of Avtomatika i Telemekhanika (USSR) 1963, v. 24, no. 6, p. 785-798.

Descriptors: (*Computers, Optimization), Automatic, Control, Numerical analysis, Functions, Differential equations, Dynamics, Stability, Operators (Mathematics), USSR.

Consideration is given to the dynamics of continuous automatic optimizers in disturbance control systems by intended work for automatic alignment of the compensator parameters. Transient responses and stability conditions under statistically assigned disturbances as well as under determined disturbances are analyzed. (Author)

AD-605 602 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON ONE EVALUATION OF DISTURBANCES OF SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS, I,
by V. M. Alekseev. 18 Mar 64, 16p
FTD MT63 312; TT 64 71339
Unclassified report

Edited machine trans. of Moscow Univ. Vestnik. Seriya 1: Matematika, Mekhanika (USSR) 1961 [v. 16] no. 2, p. 28-36.

Descriptors: (*Differential equations, Perturbation theory), Theorems, Inequalities, Equations, Errors, USSR, Stability.

The theory of ordinary differential equations and their association with evaluations of disturbances are examined.

AD-605 603 Div. 15
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF THE CONTOUR INTEGRAL AND ITS APPLICATION TO THE SOLUTION OF MANY-DIMENSIONAL MIXED PROBLEMS FOR DIFFERENTIAL EQUATIONS OF THE PARABOLIC TYPE,
by M. L. Rasulov. 10 Mar 64, 34p
FTD MT64 33, TT 64 71340
Unclassified report

AD-605 647 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON NON-NEGATIVE DIFFERENCE ANALOGUES OF ELLIPTIC DIFFERENTIAL EQUATIONS.
Technical summary rept.
by D. Greenspan and P. C. Jain. Jun 64, 18p
MRC-TSR-490
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Partial differential equations, Difference equations), (*Difference equations, Partial differential equations), Operators (Mathematics), Functions, Taylor's series, Series, Boundary value problems, Numerical analysis.

AD-605 648 Div. 15
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
NEWTON'S METHOD FOR CHARACTERISTIC VALUE-VECTOR PROBLEMS.
Technical summary rept.
by P. M. Anselone and L. B. Rall. Jun 64, 26p
MRC-TSR-492
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Iterative methods, Matrix algebra), (*Operators (Mathematics), Functional analysis), Real numbers, Complex numbers, Perturbation theory, Sequences, Programming (Computers), Numerical analysis.

A general characteristic value-vector problem for linear operators in real Banach spaces is formulated as a nonlinear equation in the product space of the given space and the real scalar field. Newton's method and a modified form of Newton's method are investigated for the solution of this equation from the standpoints of theory and technique. An application is given to the case that the operator considered is a perturbation of one with known characteristic values and vectors. A method is presented for extending the results for real spaces to complex spaces. (Author)

AD-605 649 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
MULTI-VALUED HOMOMORPHIC MAPPINGS AND SUBDIRECT COVERS OF PARTIAL ALGEBRAS.
Technical summary rept.
by Michael Yoeli. Jul 64, 20p MRC-TSR-493
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Mapping (Transformations), Algebras), (*Algebras, Mapping (Transformations)), Set theory, Binary arithmetic, Transformations (Mathematics), Automata, Synthesis, Algebra.

A partial algebra is subdirectly covered, if it is represented as homomorphic image if a subdirect product, subject to certain uniqueness restrictions. A complete characterization of such representations is obtained in this paper. As important tool of this research the concept of 'weak homomorphism' is introduced. This is an extension of the usual concept of (partial) homomorphism to multi-valued mappings. Well-known results on homomorphisms are generalized accordingly. The approach and methods of this research originated in a study of automata decompositions and the results are applicable to the synthesis of automata (sequential machines). (Author)

AD-605 650 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
QUASILINEAR UNIFORMLY ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS AND DIFFERENCE EQUATIONS.
Technical summary rept.,
by G. T. McAllister. Jul 64, 16p MRC-TSR-494
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Partial differential equations, Differece equations), (*Difference equations, Partial differential equations), Functions, Boundary value problems, Sequences, Theorems, Matrix algebra, Series.

AD-605 651 Div. 15
OTS Prices: HC $3.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
STABILITY, PERIODICITY AND ALMOST PERIODICITY OF SOLUTIONS OF NONLINEAR DIFFERENTIAL EQUATIONS IN BANACH SPACES,
by C. T. Taam. Jul 64, 58p MRC-TSR-496
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Nonlinear differential equations, Theory), (*Functional analysis, Nonlinear differential equations), Invariance, Functions, Complex numbers, Transformations (Mathematics), Integrals.

Conditions for the existence and stability of bounded solutions, periodic solutions and almost periodic solutions of certain nonlinear differential equations in Banach spaces are obtained. The dependence of these solutions on a parameter is also investigated from the point of view of continuity, measurability and summability. (Author)

AD-605 652 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
EQUIVALENT CLASSES OF SINGULAR PERTURBATION PROBLEMS,
by W. A. Harris, Jr. Aug 64, 24p MRC-TSR-502
Contract DA 11 022ORD2059

Unclassified report

Descriptors: (*Differential equations, Perturbation theory), (*Perturbation theory, Differential equations), Matrix algebra, Series, Transformations (Mathematics).

Necessary and sufficient conditions are given so that the systems of differential equations epsilon H dy/dx = A (x, epsilon) y and epsilon H dy/dx = B(x, epsilon) z are equivalent under the transformation y = Tz where H is a diagonal matrix with entries non-negative integers and B is a block diagonal matrix.
(Author)

t that are generated by a single particle initially at the point x in I. By considering N sub t (x) as a regenerative process with respect to the random age and position of the initial particle when it is transformed, a functional equation is developed for the generating function for N sub t (x). This functional equation is the basis for the study of the population probabilities P(N sub t (x) = n), n = 0,1,2, ... , as function of x in I and t in (0, infinity). The principal results develop the behavior of N sub t (x) for large t and the dependence of such behavior on x. A convergence is established in distribution for those processes for which N sub t (x) can increase without bound with positive probability as t approaches infinity. (Author)

AD-605 639 Div. 15, 9
OTS Prices: HC $3.00/MF $0.75

Mathematics Research Center, Univ. of Wisconsin, Madison.
NUMERICAL STUDIES OF THE NAVIER-STOKES EQUATIONS.
Technical summary rept.
by D. Greenspan, P. C. Jain, R. Manohar, B. Noble, and A. Sakurai. May 64, 66p MRC-TSR-482
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Partial differential equations, Numerical analysis), (*Numerical analysis, Partial differential equations), (*Fluid flow, Incompressible flow), Viscosity, Fluid mechanics, Fourier analysis, Series.

This report summarises work in progress at the Mathematics Research Center with regard to numerical solution of the time-dependent Navier-Stokes equations governing the flow of an incompressible viscous fluid. Two problems are considered in connection with flow in rectangular regions, one involving periodic boundary conditions, the other involving fixed and moving walls. In each case two methods of approach are investigated, one using finite differences, the other using Fourier series in the space variables. (Author)

AD-605 641 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
POSITIVE OPERATORS AND AN INERTIA THEOREM.
Technical summary rept.
by Hans Schneider. May 64, 18p MRC-TSR-484
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Theorems, Matrix algebra), Operators (Mathematics), Transformations (Mathematics), Topology.

A generalization of the theorem of Perron-Frobenius is used to prove an inertia theorem, which contains Lyapunov's theorem and Stein's theorem as special cases. It is pointed out that there is a close relation between the inertia theorem and known results on M-matrices. (Author)

AD-605 642 Div. 15, 25
OTS Prices: HC $3.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON THE GENERAL CONCEPT OF STABILITY AND LYAPUNOVS DIRECT METHOD.
Technical summary rept.,
by W. Hahn. Jun 64, 54p MRC-TSR-485
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Stability, Motion), (*Equations, Motion), Theorems, Functions, Real variables, Differential equations, Inequalities, Numerical methods and procedures, Functional analysis, Dynamics.

A general concept of motion is dealt with covering various types of motions, defined by differentional equations, difference equations etc., as special cases. A general definition of 'stability' and 'attractivity' of a fixed motion is given which comprises most of the numerous modifications of the original concept of stability. Lyapunov's direct method, in appropriate extension, is applied in order to obtain general stability criteria for the general type of motions under discussion. (Author)

AD-605 643 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
FURTHER PROPERTIES OF A SEQUENTIAL TEST OF FIT.
Technical summary rept.
by Lionel Weiss. May 64, 16p MRC-TSR-486
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Statistical tests, Sequential analysis), (*Sequential analysis, Statistical tests), Sampling, Statistical functions, Probability, Power series, Curve fitting, Stochastic processes, Monte Carlo method.

In earlier papers, a sequential test of fit was proposed and examined. In the present paper, the expected sample size under alternatives to the null hypothesis is investigated, and a modification of the test is proposed which is more easily compared to other tests. (Author)

AD-605 646 Div. 15
OTS Prices: HC $3.00/MF $0.75

Mathematics Research Center, Univ. of Wisconsin, Madison.
GRADUATED LOGARITHMIC FIELDS AND STABILITY,
Technical summary rept.
by Walter Strodt. Jun 64, 62p MRC-TSR-489
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Set theory, Algebra), (*Operators (Mathematics), Polynomials), Functions, Numerical analysis, Complex numbers, Rational numbers, Power series, Invariance, Sequences, Theorems.

In this report the concept of graduated logarithmic field is defined and developed. A graduated logarithmic field is a graduated field, (introduced by the author: On the algebraic closure of certain partially ordered fields, Trans. Amer. Math. Soc. 105 (1962) pp. 229-250), which is endowed with a differentiation operator D and with logarithms i.e. solutions of the equations Dxi sub O = 1, xi sub O Dxi sub 1 = 1, xi sub O xi sub 1 Dxi sub 2 = 1, ...; the operator D is postulated to have a certain stability with respect to the partial order in the underlying graduated field. In this abstract setting, the algorithms of the principal monomial, and of approximate factorization (introduced by the author in a function-theoretic setting (Mem. Amer. Math. Soc. Nos. 13 and 26) are carried out in a greatly generalized form and given new interpretations in terms of the concept of stability. (Author)

AD-605 784 Div. 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PARTIALLY CONTROLLABLE RANDOM WALK,
by T. M. Cover. Sep 61, 32p P-2450
Unclassified report

Descriptors: (*Numerical methods and procedures, Game theory), (*Game theory, Numerical methods and procedures), Sequences, Probability, Equations, Dynamic programming, Control systems, Theory, Functions.

This paper deals with an almost uncontrollable process which will be termed a partially controlled random walk. A particle performs a random walk on an interval (o, a). A utility U sub o (x) is associated with each position x on (o, a). The amplitude of the random walk is controllable at each stage. The process is termed almost uncontrollable because the random walk is assumed to have zero mean. Gambling terminology is used because of its extensive vocabulary, but the utility functions U sub o (x) can be non-monotonic and discontinuous--more general functions than their interpretation as gambling utilities would suggest. This problem may be viewed as a sequence of fair gambles on a nonlinear utility function. It is shown that with certain betting sequences a certain higher utility U(x) can be associated with each point x, where U(x) is now the expected utility at the end of the betting sequence beginning with capital x. An upper bound on U(x) (over all possible infinite betting sequences) will be derived. This maximum expected utility U(x) has a very nice relation to U sub o (x), the actual utility.

AD-605 791 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON A LOCAL LIMIT THEOREM FOR INHOMOGENOUS MARKOV CHAINS,
by V. A. Statulyavicus. 25 Aug 56, 8p T-67
TT 64 71371
Unclassified report

Trans. of Akademiya Nauk SSSR. Doklady, 1956, v. 107, no. 4, p. 516-519.

Descriptors: (*Probability, Theorems), Measure theory, Stochastic processes, Vector analysis, Algebra, Sequences, Statistical functions, Integrals, USSR.

AD-605 793 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON SOME IDENTICALLY DISTRIBUTED STATISTICS,
by Y. V. Linnik. 1 Feb 57, 6p T-71
TT 64 71373
Unclassified report

Trans. from Akademiya Nauk SSSR. Doklady, 1953, v. 89, no. 1.

Descriptors: (*Statistical distributions, Theory), Real numbers, Statistical functions, Distribution theory, Number theory, Stochastic processes, Theorems, USSR.

AD-605 820 Div. 15
OTS Prices: HC $1.00/MF $0.50

Personnel Research Lab. (6570th), Aerospace Medical Div., Lackland AFB, Tex.
CALCULATION OF THE PERCENTAGE POINTS OF THE F DISTRIBUTION,
by George I. Neel, Larry K. Whitehead, and Robert A. Bottenberg. Jun 64, 16p
Proj. 7719, Task 771901
PRL TDR64 16
Unclassified report

Descriptors: (*Statistical distributions, Numerical analysis), Probability, Iterative methods, Linear programming, Programming (Computers), Polynomials, Statistical tests, Statistical analysis, Psychometrics.

This paper reports a procedure for computing the cutoff F statistic (percentage point), given the probability (P) and the degrees of freedom determined by the experimental design. The technique involves applying a previously developed computing program to compute P from a trial value of F. From the discrepancy between the computed P and the required P a new trial value of F is determined. Iteration continues until the trial value of F produces a computed probability acceptably close to the required probability. An appendix gives the FORTRAN listing of the computing program. (Author)

AD-605 826 Div. 15, 8, 18, 30
OTS Prices: HC $3.00/MF $0.75

Dunlap and Associates, Inc., Darien, Conn.
MATHEMATICAL PROGRAMMING TECHNIQUES FOR INFORMATION SYSTEM DESIGN,
by U. O. Gagliardi, C. G. Ying, and L. G. Holt.
Jul 64, 92p
Contract AF19 628 2830, Proj. 2804
ESD TDR64 530
Unclassified report

Descriptors: (*Mathematical programming, Communication theory), (*Communication theory, Mathematical programming), Operations research, Communication systems, Computers, Command and control systems, Bombs, Damage, Determination, Weapon systems, Decision theory, Statistical analysis, Effectiveness, Design.

Identifiers: Information systems, Bayes effectiveness.

The problem of establishing the effectiveness of an information system is considered. An effectiveness measure suggested by recent development in statistical decision theory is presented. Sample evaluations or system designs are used to illustrate here the adoption of such a measure which allows selecting the parameters of the system in a manner consistent with the user preference. (Author)

AD-605 868 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE SOLUTION OF ONE DIFFERENTIAL EQUATION WITH VARIABLE COEFFICIENTS,
by V. A. Sibiryakov. 16 Apr 64, 8p
FTD MT63 308; TT 64 71392
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Matematika (USSR) 1962, no. 4(29) p. 143-145.

Descriptors: (*Differential equations, Numerical analysis), (*Functions, Differential equations), Sequences, Power series, Bessel functions, Conical bodies, Structural shells, Strength, Equations, USSR.

AD-605 872 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command,

AD-605 653 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
BAYESIAN ESTIMATION IN MULTIVARIATE ANALYSIS,
by Seymour Geisser. Aug 64, 20p MRC-TSR-503
Contract DA1 022ORD2059

Unclassified report

Descriptors: (*Statistical analysis, Theory), Probability, Statistical functions, Distribution theory, Analysis of variance, Matrix algebra.

The Bayes approach to Multivariate Analysis taken previously by Geisser and Cornfield (JRSS Series B, 1963 No. 2, pp. 368-376) is extended and given a more comprehensive treatment. Posterior joint and marginal densities are derived for vector means, linear combinations of means; simple and partial variances; simple, partial and multiple correlation coefficients. Also discussed are the posterior distributions of the canonical correlations and of the principal components. For the general multivariate linear hypothesis, it is demonstrated that the joint Bayesian posterior region for the elements of the regression matrix is equivalent to the usual confidence region for these parameters. The joint predictive density of a set of future observations generated by the linear hypothesis is obtained thus enabling one to specify the probability that a set of future observations will be contained in a particular region. (Author)

AD-605 667 Div. 15
OTS Prices: HC $1.00/MF $0.50

Brown Univ., Providence, R. I.
A COMPLEX POMPEIU PROBLEM,
by Richard F. DeMar and Philip J. Davis. 1964
24p
Contract Nonr562 36

Unclassified report

Prepared in cooperation with Miami Univ., Oxford, Ohio.

Descriptors: (*Complex variables, Theorems), (*Functions, Complex variables), Transformations (Mathematics), Functional analysis, Integrals, Set theory, Sequences, Integral transforms.

AD-605 739 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON STOCHASTIC APPROXIMATION METHOD AND OPTIMAL FILTERING THEORY,
by Yu Chi Ho. Aug 62, 6p P-2622

Unclassified report

Descriptors: (*Stochastic processes, Matrix algebra), Optimization, Mathematical prediction, Vector analysis, Statistical analysis.

This paper establishes some connections among the maximum likelihood estimate, the optimal filtering and the stochastic approximation solutions to the following well-known problem: Consider the vector-matrix equations Ax + v sub k = b sub k = 1, 2, ... where A is a given r x n matrix; x is an unknown n-vector; v sub k is a random r-vector with E(v sub k) = 0 and E(v sub k v sub j) = I delta(k - j) b sub k is a r-vector of observation. It is desired to determine an estimate x for the unkown parameters x which is optimal in some sense.

AD-605 748 Div. 15, 9
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME SPECIAL SOLUTIONS OF THE BOUNDARY LAYER EQUATIONS FOR A COMPRESSIBLE FLUID,
by A. Sh. Dorfman and E. T. Shvetz. 15 May 58, 10p T-88
TT 64 71367

Unclassified report

Trans. of Prikladnaya Matematika i Mekhanika (USSR) 1955, v. 19, p. 509-512.

Descriptors: (*Fluid mechanics, Compressible flow), (*Differential equations, Motion), (*Boundary layer, Equations), Fluid flow, Dynamics, Thermodynamics, USSR.

AD-605 755 Div. 15
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE THEORY OF THE EQUATION OF DARBOUX AND TRICOMI,
by F. I. Frankl'. 27 Aug 64, 42p
FTD MT63 347; TT 64 71352

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Izvestiya. Seriya Matematicheskaya, 1946, v. 10, p. 135-166.

Descriptors: (*Partial differential equations, Theory), (*Boundary value problems, Partial differential equations), Operators (Mathematics), Functions, Integral equations, Special functions (Mathematical), Theorems, USSR.

The solution is given of two boundary value problems for the Darboux-Tricomi equation in the domain of the upper half-plane, adjoining a segment of the axis of abscissas. The solution is obtained by the method of a double layer; with several limitations removed, which in other works were put on the form of the boundary of the domain. (Author)

AD-605 777 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SIMPLEST IMBEDDINGS OF THE COMPLETE 12 GRAPH,
by J. W. T. Youngs. Aug 61, 8p P-2426

Unclassified report

Descriptors: (*Graphics, Geometry), Geometric forms, Topology, Theorems, Euler's angles.

AD-605 778 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
REMARKS ON THE GENUS OF A COMPLETE GRAPH,
by J. W. T. Youngs. Aug 61, 8p P-2428

Unclassified report

Descriptors: (*Graphics, Geometry), Geometric forms, Topology, Theorems, Euler's angles.

AD-605 959 Div. 15
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
EFFECTS OF SAMPLING A CONTINUOUS STOCHASTIC PROCESS AT EQUAL INTERVALS,
by T. Magness. 14 Sep 56, 4p GM-42 53
AD 219 417
Unclassified report

Descriptors: (*Monte Carlo methods, Stochastic processes), (*Stochastic processes, Monte Carlo methods), Sampling, Statistical functions, Fourier analysis, Series, Statistical processes, Integral transforms.

AD-605 993 Div. 15, 26
OTS Prices: HC $3.00/MF $0.75

Applied Mathematics and Statistics Labs., Stanford Univ., Calif.
RELIABILITY GROWTH MODELS.
Technical rept. no. 74,
by Jack E. Bresenham. 24 Aug 64, 98p
Contract Nonr225 53, Proj. NR042 002
Unclassified report

Supported in part by Department of the Army, Washington D. C. and Department of the Air Force, Washington, D. C.

Descriptors: (*Reliability, Mathematical models), (*Operations research, Reliability), Probability, Failure (Mechanics), Engineering, Model theory, Quality control, Statistical analysis, Game theory.

The purpose of this paper is to propose several quantitative models which seem to offer a reasonable answer to reliability estimation and prediction with respect to a continuing development process in which test knowledge is used to sequentially improve subsequent systems. Prior to presenting the three basic models earlier growth models are briefly surveyed.

AD-606 018 Div. 15
OTS Prices: HC $3.00/MF $0.75

California Univ., Berkeley.
APPLICATION OF FUNCTIONAL ANALYSIS TO NUMERICAL ANALYSIS; LECTURES.
Technical rept. no. 5,
by L. Collatz and E. C. Zachmanoglou. May 60, 77p
Contract Nonr222 60; Grant NSF G11099, Proj. NR041 221
Unclassified report

Seminar 290d.

Descriptors: (*Numerical analysis, Functional analysis), (*Functional analysis, Numerical analysis), Equations, Iterative methods, Topology, Operators (Mathematics).

Contents: Typical questions in numerical analysis; Various types of topological spaces; Ordering, convergence, compactness; Operators in pseudo-metric spaces; The general theorem; A principle for accuracy analysis when using computers; Methods using the derivative of an operator; The order of convergence of iteration methods; The rule of false position; General theory of iteration methods of higher order; Monotonic behaviour of Newton's method.

AD-606 024 Div. 15
OTS Prices: HC $3.00/MF $0.75

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
HILL'S EQUATION. PART II. TRANSFORMATIONS, APPROXIMATION, EXAMPLES.
Research rept.,
by W. Magnus and S. Winkler. Sep 61, 100p BR-38
Contract AF49 638 229, Proj. 47500
Unclassified report

Descriptors: (*Differential equations, Theory), (*Transformations (Mathematics), Differential equations), (*Numerical analysis, Differential equations), Invariance, Perturbation theory, Functions, Frequency modulation.

It is the purpose of this report on Hill's equation to provide the reader with a few ready made transformation and approximation formulas which may be useful to anyone working on a particular problem. Some examples are discussed in detail, partly because they illustrate the general theory and partly because they appear frequently in applications. The section on the coexistence problem contains a little more than mere examples. It may be considered as a complete discussion of those results which can be obtained from the investigation of three term recurrence relations. A third part of this report will contain applications of the theory to problems of physics and engineering.

AD-606 061 Div. 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
DYNAMIC PROGRAMMING AND HAMILTON-JACOBI THEORY,
by Stuart E. Dreyfus. Sep 64, 29p RM-4275-PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Dynamic programming, Theory), (*Calculus of variations, Dynamic programming), Optimization, Functions, Partial differential equations, Integration, Simultaneous equations, Mathematical programming.

The conventional dynamic programming method for analytically solving a variational problem requires the determination of particular solution function of the fundamental partial differential equation. This solution function is called the optimal value (or return) function. Associated with it is another function, called the optimal policy function, which yields the value of the derivative, at each point, of the optimal curve to (or from, depending upon the method of solution) that point. The optimal curve itself can then be found by integration. In this memorandum, dynamic programming concepts and principles are used to develop an alternative method of analytic solution. Any solution function of the fundamental equation containing an appropriate number of arbitrary constants is sought. It is shown how such a function yields directly, by differentiations and eliminations, the optimal curve for a given variational problem. While the derivation is new, the results are equivalent to those produced when the Hamilton-Jacobi theory is applied to a general variational problem. (Author)

AD-606 076 Div. 15, 30
OTS Prices: HC $2.00/MF $0.50

Rias, Inc., Baltimore, Md.
STUDY OF NONLINEAR MECHANICS.
Final rept. for 1 Apr 63-28 Aug 64,
by S. Lefschetz and J. P. LaSalle. 28 Aug 64, 28p
Contract AF49 638 1242, Proj. 9783, Task 978302
AFOSR 64 1648
Unclassified report

Wright-Patterson AFB, Ohio.
ABOUT ON THEOREM OF K. P. PERSIDSKII,
by P. E. Vinograd. 16 Apr 64, 8p
FTD MT63 298; TT 64 71396

Unclassified report

Edited machine trans. of Uspekhi Matematicheskikh Nauk (USSR) 1954, v. 9, no. 2(60) p. 125-128.

Descriptors: (*Differential equations, Theorems), Errors, Matrix algebra, Number theory, Sequences, USSR.

This work presents the author's attempt to show that incorrectness exists in Persidskii's theorem on the characteristic indices of a system of differential equations.

AD-605 888 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON FORMULAS OF NUMERICAL DIFFERENTIATION WITHOUT DIFFERENCES,
by D. P. Grossman. 28 May 64, 14p
FTD MT63 335; TT 64 71412

Unclassified report

Edited machine trans. of Aviatsionnyi Institut, Moscow. Trudy (USSR) 1956, v. 61, p. 30-36.

Descriptors: (*Numerical analysis, Functions), (*Functions, Numerical analysis), Complex numbers, Real numbers, Equations, Algebra, Taylor's series, Operators (Mathematics), USSR.

AD-605 898 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
FORMULA FOR REPRESENTING THE PRODUCT OF ORIGINALS,
by V. Ya. Natanzon. 16 Apr 64, 8p
FTD MT63 305; TT 64 71419

Unclassified report

Edited machine trans. of Prikladnaya Matematika i Mekhanika (USSR) 1956, v. 20, no. 9, p. 671-672.

Descriptors: (*Integral transforms, Numerical methods and procedures), (*Numerical methods and procedures, Integral transforms), Integral equations, Transformations (Mathematics), USSR.

AD-605 899 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
POLAR CONJUGACY WITH RESPECT TO SOME FIGURES OF II-ND ORDER IN THE IV-DIMENSIONAL SPACE,
by V. A. Manevich. 16 Apr 64, 8p
FTD MT63 313; TT 64 71420

Unclassified report

Edited machine trans. of Ukrainskii Matematicheskii Zhurnal (USSR) 1958, v. 10, no. 3, p. 333-334.

Descriptors: (*Projective geometry, Theorems), Geometric forms, Production, Geometry, USSR.

This work contains proofs of theorems pertaining to axisters and conosters of a four-dimensional space.

AD-605 912 Div. 15, 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CONCERNING THE THEORY OF LINEAR DIFFERENTIAL EQUATIONS WITH PERIODIC COEFFICIENTS AND TIME DELAY,
by S. N. Shimanov. 25 Mar 64, 17p
FTD MT63 272; TT 64 71387

Unclassified report

Edited machine trans. of Prikladnaya Matematika i Mekhanika (USSR) 1963, v. 27, no. 3, p. 450-458.

Descriptors: (*Differential equations, Theory), (*Time-lag theory, Control systems), Functional analysis, Operators (Mathematics), Integral transforms, Stability, Control, Motion, USSR.

This study of a system of linear differential equations with periodic coefficients and aftereffect (delay) presents interest, in particular, for systems of automatic regulation. The investigation has a bearing on the methodology of consideration of equations with delay in time in the function space of continuous functions proposed by N. N. Krasovskiy.

AD-605 914 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON SPECTRUM OF HARMONIZED DYNAMIC SYSTEMS,
by M. I. Grabar'. 17 Apr 64, 8p
FTD MT63 330; TT 64 71389

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Doklady, 1956, v. 109, no. 4, p. 687-689.

Descriptors: (*Harmonic analysis, Dynamics), (*Dynamics, Harmonic analysis), Differential geometry, Differential equations, Functions, Series, Theorems, USSR.

AD-605 915 Div. 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE FROMMER DISTINCTION PROBLEMS,
by R. E. Vinograd and D. M. Grobman. 22 Apr 64, 12p
FTD MT63 319; TT 64 71414

Unclassified report

Edited machine trans. of Uspekhi Mathematicheskikh Nauk (USSR) 1957, v. 12, no. 5(77) p. 191-196.

Descriptors: (*Differential geometry, Theory), Transformations (Mathematics), Differential equations, Integrals, Functions, Numerical methods and procedures, USSR.

The author proposes a single method of solution to two Frommer distinction problems concerning integral curves of ordinary first order differential equations in the neighborhood of an individual point, having a rational character. Consideration is given to a method used by Lon.

16. Medical Sciences

AD-605 204 Div. 16, 28
OTS Prices: HC $3.00/MF $0.50

Biotechnology Lab., Univ. of California, Los Angeles.
UPPER EXTREMITY PROSTHETICS RESEARCH. HUMAN TRACKING. SENSORY MOTOR CONTROL. MYOELECTRIC CONTROL STUDIES.
Progress rept.
15 Mar 64, 54p UCLA-DE-64-30
Contracts V1005M2075, N123 60530 23558A
Unclassified report

Prepared in cooperation with Spacelabs, Inc. Van Nuys, Calif.

Descriptors: (*Optical tracking, Performance (Human)), (*Prosthetics, Medical research), (*Artificial limbs, Control systems), Human engineering, Motor reactions, Sensory mechanisms, Tracking, Medical cameras, Operators (Personnel), Amputees, Mechanical organs.

Contents: needs analysis for development of externally-powered prostheses design specifications; analysis of existing externally-powered prostheses and development of advanced design specifications; an evaluation of the optiscan head-mounted eye movement camera for prosthetic motor-skills evaluation (research on sensory-motor control; myoelectric control studies; research on the performance of human operators of tracking systems); performance evaluation of variables of the optical system on the nots tracking simulator; and multiman tracking studies.

AD-605 213 Div. 16, 12
OTS Prices: HC $2.25/MF $0.75

Farr Cytochemical Labs., Camden, Maine.
RESEARCH ON THE CYTOCHEMISTRY OF CELL WALLS OF MICROORGANISMS.
Rept. for Feb-Nov 63,
by Wanda K. Farr. Jun 64, 54p
Contract AF33 657 10166, Proj. 7164, Task 716405
AMRL TDR64 52
Unclassified report

Descriptors: (*Nutrition, Astronauts), (*Fungi, Cytochemistry), (*Cytochemistry, Fungi), Space biology, Cells (Biology), Food, Cellulose, Calcium compounds, Salts, Colloids, Colors, Enzymes, Hydrolysis, Diffraction analysis, Refractive index, Proteins, Digestive system, Lipids, Pectins, Culture media.

As a part of the research program designed to solve the nutritional problems of astronauts during extended explorations of space, cell wall substances of four fungi, Heterocephalum aurantiacum, Spicaria sp., Cladosporium sp. and Linderina pennispora have been identified and localized by standard cytochemical methods. Chitin is the resistant cell wall material in the component cells of all of these fungi and results of efforts to identify cellulose in the same cell walls have been negative. Excretions which accumulate on the surfaces of the aerial corticating hyphae of H. aurantiacum are composed primarily of calcium salts and an unidentified colloidal material, yellow-orange in color and having many characteristics in common with the so-called fungal gamboge. Reactions of the previously untreated chitinous cell walls to the enzyme, chitinase, are positive. Enzymatic hydrolysis represents the most suitable method now available for the conversion of chitin to N-acetylglucosamine with the accompanying breakdown of the cell wall and concurrent release of nutritive substances in the protoplast. X-ray diffraction patterns of chitin have been obtained from purified cell wall samples. Measurements of these same samples, at successive stages of removal of non-chitinous materials, show a gradual increase in refractive index values. (Author)

AD-605 238 Div. 16, 3, 18
OTS Prices: HC $5.00/MF $1.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MILITARY EPIDEMIOLOGY,
ed. by I. I. Daal'-berg. 28 Jul 64, 184p
FTD MT64 245; TT 71290
Unclassified report

Edited machine trans. of mono. Voennaya Epidemiologiya, Leningrad, 1962, 136p.

Descriptors: (*Epidemiology, Military medicine), (*Military medicine, USSR), Communicable diseases, Infectious diseases, Military personnel, Civilian personnel, Biological warfare, Therapy, Immunity, Medical examination, Medical equipment, Hospitals, Diagnosis, Defense systems, Public health, Antibiotics, Armed forces supplies, Sanitary engineering.

The study of the peculiarities of the epidemic process and the active influence on its course not only in troops, but also among the population surrounding the troops is discussed. This need is described as urgent in contemporary conditions, when in the case of unleashing war, the enemy can use bacterial means of attack. Military epidemiology is viewed as a division of epidemiology and a branch of military medicine which studies the peculiarities of the course of the epidemic process in wartime, and in military groups in peacetime. An essential division of military epidemiology is the division, dedicated to the study of the peculiarities of the origin, spread and liquidation of epidemic diseases in wartime with the creation of an artificial epidemic process by the enemy. On the basis of the learned regularities, military epidemiology has developed prophylactic and antiepidemic measures in troops, and in wartime, frequently among the surrounding population, and has determined the form and methods of activity of the military-medical service for the protection of troops from epidemic diseases.

AD-605 250 Div. 16, 30
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
NEUROPHYSIOLOGICAL MODELS: METHODS AND APPLICATIONS.
Progress rept. for Jun-Dec 63,
by Donald H. Perkel. Sep 64, 68p RM-4247-NIH
Grant NIH GM09608 03
Unclassified report

Descriptors: (*Mathematical models, Nervous system), (*Nerve cells, Mathematical models), (*Nervous system, Simulation), Programming (Computers), Digital computers, Physiology, Statistical processes, Phase studies, Stability, Nerve impulses, Nerve fibers, Biophysics, Stochastic processes, Equations, Probability.

A summary of the research in neurophysiological models that was done at RAND under an NIH grant during the period June-December 1963 is presented. The report describes the computer programs used to simulate certain activities of nerve cells and networks, and outlines some applications of these programs to experimental questions in neurophysiology. Plans for future work are mentioned. (Author)

Descriptors: (*Nonlinear systems, Mechanics), (*Mechanics, Nonlinear systems), (*Differential equations, Time-lag theory), (*Control, Theory), (*Stability, Theory).

Research accomplishments in the areas of (1) functional differential equations, (2) theory of stability, (3) mathematical theory of control, and (4) ordinary differential equations and related topics are reported.

AD-606 090 Div. 15
OTS Prices: HC $2.00/MF $0.50

Gas Dynamics Lab., Princeton Univ., N. J.
THE COMBINATORY INTEGRAL TRANSFORM AND ITS APPLICATION TO HEUN'S EQUATION,
by H. H. Chiu and S. I. Cheng. Feb 64, 37p
AER-678
Contract AF49 638 1271; Grant AF AFOSR112 63
AFOSR 64 0899

Unclassified report

Descriptors: (*Integral transforms, Differential equations), (*Differential equations, Integral transforms), Transformations (Mathematics), Integral equations, Matrix algebra, Power series, Special functions (Mathematical).

The combinatory integral transforms mean the successive application of the Euler and the Laplace transforms in proper combination. Solutions to a certain class of Heun's equations and many classes of third order equations can be obtained through the use of the combinatory transform. Several properties of the Euler and the Laplace integral transforms are developed in Sections 2 and 3. The combinatory transform is studied in Section 4. The application of this transform in solving a Heun's equation is demonstrated in Section 5. The integral representation of the solution to a particular Heun's equation can be expanded as a power series of the hypergeometric functions, which may be compared with the one obtained by Erdelyi.

AD-606 096 Div. 15, 6
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PROBABILITY AND STATISTICS IN SYSTEMS WORK,
by I. S. Reed. 16 Aug 61, 38p P-2407

Unclassified report

Prepared for presentation at the Workshop on Systems Engineering in Electrical Engineering Education, Univ. of Pennsylvania, Moore School of Electrical Engineering, week of August 28, 1961.

Descriptors: (*Systems engineering, Statistical analysis), (*Statistical analysis, Search radar), (*Search radar, Mathematical models), (*Probabiltiy, Search radar), Automatic, Detection, Reliability, Digital systems, Radar receivers, Radar equipment, Display systems, Sampling, Mathematical analysis, Data transmission systems, Microwave relay systems, Sequences, Queueing theory, Theory.

This paper features the application of statistics and probability to systems work by way of an example. The system chosen to illustrate such applications of statistical design is a particular statistical decision mechanism, called the mechanized radar observer. The particular fields of statistics and probability which were used in the design of this machine are discussed herein. (Author)

AD-606 097 Div. 15, 26
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
VARIOUS PROPERTIES OF THE POISSON DISTRIBUTION,
by G. F. Hadley and T. M. Whitin. 25 Aug 61, 27p
P-2421

Unclassified report

Prepared in cooperation with Chicago Univ., Ill. and California Univ., Berkeley. A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Statistical distributions, Tables), Distribution theory, Operations research, Inventory analysis, Integral transforms, Special functions (Mathematical), Mathematical models.

A table is presented of properties of the Poisson distribution which have been found useful in working with a variety of operational models. In particular the properties proved useful to the authors in obtaining explicit expressions for inventory levels, backorders, and stockout costs under various assumptions concerning the lead time distribution and penalty functions. Some of the relationships are almost immediately obvious; but were included in the paper for the sake of completeness.

AD-606 099 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
AN ASYMPTOTIC EXPANSION FOR INHOMOGENEOUS MARKOV CHAINS,
by V. A. Statulyavichus. 9 Sep 57, 4p T-75
TT 64 71438

Unclassified report

Trans. of Akademiya Nauk SSSR. Doklady, 1957, v. 112, no. 2, p. 206. A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Series, Probability), (*Probability, Series), Theorems, Stochastic processes, USSR.

An inhomogeneous Markov chain with a finite number s > 1 of possible states e sub 1, . . . , e sub 5 and transition probabilities p sub alpha beta (k) from state e sub alpha on the (k - 1)-st step to state e sub beta on the k-th step is studied.

by Charles J. Eagan. Jun 64, 16p
Proj. 8237, Task 823701
AAL TDR64 7

Unclassified report

Descriptors: (*Medical equipment, Strain Gages), (*Strain gages, Calibration), Mercury, Test equipment, Circuits.

Two methods are described for precise and convenient calibration of mercury strain gauges used for the measurement of physiological functions. One method is best used in calibration for linear extension while the other is most useful in mercury strain gauge plethysmography. (Author)

AD-605 257 Div. 16
OTS Prices: HC $2.00/MF $0.50

Arctic Health Research Center, Anchorage, Alaska.
TREATMENT OF UNDILUTED HUMAN WASTE BY THE ACTIVATED SLUDGE PROCESS,
by D. J. Baumgartner and C. F. Walters. Mar 64, 30p
Proj. 8246, Task 8246 1
AAL TDR63 36

Unclassified report

Prepared under Cross Service Agreement CSA 61-1.

Descriptors: (*Wastes (Sanitary engineering), Alaska), (*Radar stations, Wastes (Sanitary engineering)), Toilet facilities, Arctic regions, Sewage, Excretion, Humans, Ph, Water, Odors, Cold weather tests, Models (Simulations), Air force research.

A laboratory activated sludge system was operated to confirm field investigations which indicated that a 423-gallon recirculating activated sludge system could adequately treat the undiluted human wastes from 10 men for at least six months and provide an effluent acceptable for use as a flushing fluid. In addition, the level and the effects of overloading were noted. The effect of high pH on odor production was observed, and the importance of pH control between 6 and 7 was demonstrated. The feed COD of 44,000 mg/l (BOD = 21,000 mg/l) was reduced by about 90 per cent and the estimated water savings for toilet flushing was estimated at greater than 90 per cent. (Author)

AD-605 258 Div. 16
OTS Prices: HC $2.00/MF $0.50

Utah Univ., Salt Lake City. Coll. of Medicine.
EFFECT OF COLD EXPOSURE ON THE FORMED ELEMENTS OF MOUSE PERIPHERAL BLOOD,
by S. Marcus and F. Miya. Jun 64, 28p
Contract AF41 657 311, Proj. 8241, Task 824101
AAL TDR63 23

Unclassified report

Descriptors: (*Hematology, Cold weather tests), (*Cold weather tests, Hematology), Acclimatization, Blood counts, Blood cells, Leukocytes, Lymphocytes, Eosinophils, Hematocrit, Body weight, Adrenal glands, Exposure, Mice.

A search was made for a hematological parameter that might indicate when acclimatization to cold occurred in mice. The formed elements of mouse peripheral blood tested were total white blood cells and the absolute numbers of polymorphonuclear leucocytes, monocytes, lymphocytes, stress lymphocytes and eosinophils. In addition the hematocrit, body weights, and adrenal gland weights were measured. No consistent changes between 21 and 2C caged mice were observed with respect to the total WBC, PMN, stress lymphocytes, lymphocytes and monocytes. The eosinophils of the cold stressed animals were consistently lower than the 21C caged mice. The body weights of the cold exposed animals showed initial decreases but this was compensated and weight gain proceeded normally after five days post-exposure. The adrenal glands showed maximally increased weights at 24 hours post-exposure. The results of the experiment were unrewarding with respect to finding a parameter for cold acclimatization. (Author)

AD-605 306 Div. 16
OTS Prices: HC $2.00/MF $0.50

Linde Div., Union Carbide Corp., Tonawanda, N. Y.
RESEARCH AND DEVELOPMENT OF PROCEDURES FOR THE LOW-TEMPERATURE PRESERVATION OF BLOOD.
Final rept,
by A. P. Rinfret and C. W. Cowley. 15 Aug 64, 30p
Contract Nonr3003 00

Unclassified report

Descriptors: (*Blood, Preservation), (*Freezing, Blood), Blood cells, Additives, Storage, Polymers, Blood transfusions, Medical equipment, Containers, Low-temperature research, Biological assay

Procedures were developed for the long term preservation of whole blood or packed red cells in the frozen state using polyvinylpyrrolidone, an extracellular polymeric solute, as the protective additive. These procedures are simple and require minimal training of an operating technician. Approximately 97% of red cells will withstand the freezing, storage and thawing process and 80 to 90% of these remain in the circulatory system 24 hours after transfusion with or without post-thaw procedures. Being useful both in emergencies and for normal usage, effort should be undertaken to achieve clinical acceptance of these blood preservation procedures. (Author)

AD-605 415 Div. 16, 32
OTS Prices: HC $1.00/MF $0.50

Aerospace Technology Div., Library of Congress, Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS. PT. A. BIOSCIENCES: COMPILATION OF ABSTRACTS.
Rept. no. 19 on Soviet Developments in Life Support Systems.
2 Sep 64, 21p
ATD P64 53; TT 64 71308

Unclassified report

Surveys of Soviet-Bloc Scientific and Technical Literature.

Descriptors: (*Abstracts, Space medicine), (*Life support, Space medicine), (*Space medicine, Life support), (*Space biology, USSR), Toxicity, Oxygen, Radiation hazards, Radiation effects, Radiation sickness, Radiobiology, Whole body irradiation, Lethal dosage, Pharmacology, Radioprotective agents, Organic compounds, Weightlessness, Physiology, Closed ecological systems.

This report is the nineteenth in a series reviewing Soviet developments in life support systems. The report is based on materials made available at the Aerospace Technology Division during January and February 1964. Items are selected from Soviet open literature. The materials in this series are grouped according to the following topics: Part A. Biosciences: Space medicine and biology; Space physiology; Perceptual physiology; Space psychology; Space vehicle ecology; Survival conditions. Part B. Instrumentation.

AD-605 252 Div. 16, 32
OTS Prices: HC $7.00/MF $1.50

Wayne State Univ., Detroit, Mich.
NATURAL MAMMALIAN HIBERNATION, A BIBLIOGRAPHY,
by William V. Mayer. Jun 64, 314p
Contract AF41 657 230, Proj. 8237, Task 823703
AAL TDR63 34

Unclassified report

Prepared with partial support of the Office of Naval Research Physiology Branch.

Descriptors: (*Hibernation, Bibliographies), (*Bibliographies, Hibernation), Mammals, Vertebrates, Animals, Birds, Rodents, Body temperature, Acclimatization, Heat production (Biology), Adaptation (Physiology), Reproduction (Physiology), Metabolism, Physiology, Hypothermia, Ecology, Sleep, Behavior, Exposure, Diet, Blood, Hormones, Adipose tissue, Adrenal glands, Enzymes.

The bibliography consists of over 2,100 references directly impinging upon natural mammalian hibernation, including a few references to birds and potential hibernators. A cross-referenced subject matter index makes it possible to locate with relative ease articles dealing with specific features of hibernation. The material was assembled over a number of years by detailed examination of library holdings, review literature, abstracting journals, The Zoological Record, B.A.S.I.C., and individual journals, and with the cooperation of fellow researchers in the field of natural mammalian hibernation. The assembled references were checked for their applicability for inclusion in this bibliography, alphabetized by author, and numbered for cross reference indexing. The parameters of the initial charge for making this bibliography have eliminated references to poikilothermous animals and most references to hypothermia, and have been the guidelines used to reduce some 7,000 references to the approximately one-third which finally comprise this bibliography.

AD-605 253 Div. 16
OTS Prices: HC $1.00/MF $0.50

New Hampshire Univ., Durham.
VARIATIONS OF HUMORAL AND CELLULAR ELEMENTS OF THE BLOOD OF ALASKAN GROUND SQUIRRELS DURING HIBERNATION AND INDUCED HYPOTHERMIA,
by J. P. Schmidt and T. G. Metcalf. Dec 63, 20p
Contract AF41 609 1856, Proj. 8241, Task 824101
AAL TDR63 21

Unclassified report

Descriptors: (*Hibernation, Squirrels), (*Blood diseases, Hibernation), Hypothermia, Blood counts, Blood cells, Erythrocytes, Leukocytes, Blood volume, Hemoglobin, Complement, Body temperature, Electrophoresis, Globulins, Blood proteins.

Alaskan ground squirrels exhibited a profound leucopenia during hibernation and hypothermia. The total number of erythrocytes declined slightly also but the differences could not be established as statistically significant. The packed cell volume values were significantly different from normal animals only during hibernation. Hemoglobin measurements revealed a slight, though not significant, drop during hibernation. Measurements of complement titers in the serum withdrawn from active, hibernating and hypothermic animals suggested that significant differences in complement activity did not accompany changes in body temperature during either hibernation or hypothermia. Electrophoretic patterns of sera from hibernating ground squirrels revealed the presence of a new peak in the vicinity of the beta-globulin component. The appearance of this peak was shown to correspond with the onset of hibernation and its disappearance with arousal of the animal from hibernation. (Author)

AD-605 254 Div. 16
OTS Prices: HC $1.00/MF $0.50

New Hampshire Univ., Durham.
THE INFLUENCE OF HIBERNATION UPON EXPERIMENTAL INFECTIONS IN THE ALASKAN GROUND SQUIRREL,
by T. G. Metcalf and J. P. Schmidt. Dec 63, 10p
Contract AF41 609 1856, Proj. 8241, Task 824101
AAL TDR63 25

Unclassified report

Descriptors: (*Coxsackie virus, Squirrels), (*Hibernation, Squirrels), Mouth, Tissues (Biology), Tissue culture cells, Infections, Storage, Microorganisms, Arctic regions, Hypothermia.

Coxsackie virus infection occurred in both active and hibernating states by extension of virus into the tissues of ground squirrels following oral administration of virus. Virus was eliminated rapidly by the active animals but retained in tissue depots of hibernating animals for a lengthy period of time. The findings pose a question of whether the Alaskan ground squirrel could serve as a reservoir for the maintenance of microbiological forms of life in arctic areas. (Author)

AD-605 255 Div. 16, 29
OTS Prices: HC $3.00/MF $0.50

Stanford Univ., Calif.
THE CALORIC COST AND FLUID AND ELECTROLYTE BALANCE IN SIMULATED SUBARCTIC SURVIVAL SISTUATIONS,
by T. A. rogers, J. A. Setliff, and J. C. Klopping.
Dec 63, 56p
Contract AF41 657 364, Proj. 8238, Task 823803
AAL TDR63 16

Unclassified report

Descriptors: (*Arctic regions, Survival), (*Acclimatization, Arctic regions), (*Starvation, Cold weather tests), Adaptation (Physiology), Electrolytes (Physiology), Dehydration, Calorimeters, Metabolism, Sodium, Diet, Blood analysis, Body weight, Heat production (Biology), Respiration, Urine, Body temperature, Proteins, Carbohydrates, Cardiovascular system.

Field investigation was undertaken in 1961-62 to determine the physiological changes concomitant with starvation in an arctic or sub-arctic environment. The results of these experiments indicate that man increases his caloric expenditure to 2300 kcal/Msq./24 hours, as is expected, but that he also displays a severe dehydration. This dehydration is accompanied by a marked loss of electrolytes, primarily sodium, and it is this isotonic dehydration that causes the severe malaise and apathy typical of starvation in the cold. The Integrating Motor Pneumotachograph is presented and its use as a device to measure caloric expenditure is described. (Author)

AD-605 256 Div. 16, 30
OTS Prices: HC $1.00/MF $0.50

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
CALIBRATION OF THE MERCURY STRAIN GAUGE,

this series are grouped according to the following topics: Part A. Biosciences - Space medicine and biology, Space physiology, Perceptual physiology, Space psychology, Space vehicle ecology, and Survival conditions; Part B. Instrumentation.

AD-605 573 Div. 16
OTS Prices: HC $1.00/MF $0.50

Boeing Scientific Research Labs., Seattle, Wash.
THE RADIATION DOSE ACCUMULATED BY BLOOD DIVERTED THROUGH A SHUNT,
by George Marsaglia. Jul 64, 12p D1-82-0362; Boeing-Math-357

Unclassified report

Descriptors: (*Mechanical organs, Blood circulation), (*Blood circulation, Radiological dosage), (*Radiological dosage, Probability), Blood cells, Hematology, Equations, Radiobiology.

Modern techniques have made it possible to divert a portion of the circulating blood through a shunt outside the body--for example in heart-lung machines, artificial kidneys, and coiled tubes where the blood may be exposed to radiation without danger to body tissues. There is some probability theory connected with such procedures, for the cells of the blood are thoroughly mixed in the body, and hence the number of times a blood cell passes through the shunt is a random variable. Several papers have been written to describe such systems by differential equations; this paper discusses the problem directly in terms of probability theory, finding the exact distribution of the number of times a blood cell has passed through the shunt and, in addition, a normal approximation which makes calculation of accumulated doses a matter of simple arithmetic. (Author)

AD-605 714 Div. 16, 29
OTS Prices: HC $1.00/MF $0.50

Midwest Research Inst., Kansas City, Mo.
A STUDY OF THE MICROBIOLOGY OF SELECTED DEHYDRATED FOOD PRODUCTS.
Progress rept. no. 1, 15 Oct 63-14 Feb 64,
by F. E. Wells. 18 Mar 64, 20p
Contract DA19 129AMC206N, Projs. 1K643303D548, 2738B

Unclassified report

Descriptors: (*Dehydrated foods, Bacteria), (*Microbiology, Dehydrated foods), Salmonella, Staphylococcus aureus, Aerobacter aerogenes, Escherichia coli, Freeze-drying, Frozen foods, Spores, Viability, Fruits, Vegetables, Meat, Culture media, Biological contamination.

Progress is reported on a bacteriological survey of 35 dehydrated foods. The following microbial groups are enumerated: (1) total aerobic (2) coliform (3) anaerobic spores and (4) Salmonella. In addition, the prefreezing, freezing and drying effects on survival of five microbial types are discussed. (Author)

AD-605 726 Div. 16
OTS Prices: HC $1.00/MF $0.50

Texas Univ., Galveston. Medical Branch.
POST GANGLIONIC CHOLINERGIC MEDIATION OF SYMPATHETIC NERVES.
Final rept. for 1 Jan-30 Apr 63, and Annual rept. for 1 May 63-30 Apr 64,
by James G. Hilton. 30 Apr 64, 2p
Grants AF AFOSR62 241, AF AFOSR63 241
AFOSR 64 1649

Unclassified report

Descriptors: (*Parasympathomimetic agents, Autonomic nervous system), (*Autonomic nervous system, Parasympathomimetic agents), Drugs, Chemotherapy, Autonomic agents, Nerve impulses, Heart, Obstruction (Physiology), Atropine.

The question of a non-specific stimulation of ganglion as proposed by Levy and Ahlquist is considered and the differences between a non-specific stimulation and the restoration of blood pressure and return of carotid occlusion response are discussed in the paper. Two additional areas of ganglionic and cardiovascular function during the neostigmine pressor response have been studied during the period of this report. Area 1 is the study of pre and post ganglionic nerve potentials. Area 2 is a study of the peripheral vascular tone during the neostigmine pressor response.

AD-605 727 Div. 16
OTS Prices: HC $2.00/MF $0.50

Henri Rousselle Hospital, Paris (France).
VISCERAL AFFERENT ACTIVITY EFFECT ON BRAIN STEM RETICULAR FORMATION.
Technical rept. (Final) 1 Jul 63-30 Jun 64,
by P. C. Dell. 1 Jul 64, 10p
Grant AF EOAR63 52
AFOSR 64 1651

Unclassified report

Descriptors: (*Nervous system, Control), (*Cranial nerves, Inhibition), (*Respiratory system, Nerve impulses), Physiology, Brain, Spinal cord, Attention, Sleep, Stimulation, Motor reactions, Electroencephalography.

The following themes were the object of investigations: (1) Afferent projections acting on the bulbar structures implied in the control of the reticular activating system (RAS). (a) Role of afferents of the IXth and Xth cranial nerves. (b) Role of afferents of spinal origin. (2) Ascending effects synchronized with the activity of the respiratory centers. (3) Comparative study of the immediate and delayed components of reticular responses. (Author)

AD-605 797 Div. 16
OTS Prices: HC $3.00/MF $0.50

Medical Coll. of Virginia, Richmond.
FLASH BURNS IN THE RABBIT RETINA AS A MEANS OF EVALUATING THE RETINAL HAZARD FROM NUCLEAR WEAPONS,
by William T. Ham, Jr., H. Wiesinger, F. H. Schmidt, R. C. Williams, and R. S. Ruffin. 1958, 54p
Contract AF18 600 1272

Unclassified report

Descriptors: (*Radiation injuries, Retina), (*Retina, Radiation injuries), (*Nuclear explosions, Radiation hazards), Test methods, Burns, Nuclear bombs, Radiological dosage, Nuclear weapons, Photographs, Ophthalmology, Cornea, Images, Eye, Thresholds (Physiology), Pathology, Neoplasms, Rabbits, Humans.

A method was evolved in this laboratory for the production and study of retinal burns in the rabbit eye. Essentially the apparatus consisted of a 24 inch Army searchlight equipped with an ellipsoidal mirror. A second ellipsoidal mirror was employed to reduce the angle of convergence to about 7 degrees, thus more nearly simulating the atomic fireball viewed at appreciable distances. Both mild and

AD-605 465 Div. 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MEDICAL PROTECTION FOR THE ANTARCTIC EXPEDITION,
by V. V. Timofeev. 29 Jul 64, 13p
FTD TT64 277; TT 64 71315

Unclassified report

Unedited rough draft trans. of Sovetskoe Zdravookhranenie (USSR) 1960, v. 19, no. 12, p. 50-54.

Descriptors: (*Exploration, Polar regions), (*Polar regions, Survival), Navigation, Naval personnel, Medical supplies, Medical examination, Food, Water, Diseases, History, USSR.

The Russian expedition to the Antarctic region in 1820 is recounted. The physical hardships and medical difficulties endured by the Russian sea-farers are described.

AD-605 469 Div. 16, 25, 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DEVICE IMITATING THE ACTIVITY OF A NERVE CELL (NEURISTOR),
by Ya. A. Reikhman. 5 Aug 64, 6p
FTD TT64 774, TT 74 71318

Unclassified report

Unedited rough draft trans. of Russian patent 156702 (appl. 792297/26-24, 27 Aug 62).

Descriptors: (*Nerve cells, Anatomical models), (*Anatomical models, Nerve cells), Semiconductor devices, Nerve impulses, Voltage, Capacitance, USSR.

A device imitating the activity of a nerve cell ('neuristor') consisting of a divided source of energy, a divided [distributed] accumulator of energy, and a divided [distributed] accumulating element is described. For the purpose of increasing the rapidity of the action of the device and the precision of the reproduction, it is designed as a multilayer semiconductor, consisting of a tunnel diode and a four-layer diode connected in sequence through an active resistor, shunted by a distributed capacitance. The connection between the elements ('neuristors') is accomplished by the transmission of signals along the layers of the semiconductor.

AD-605 470 Div. 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MEDICAL INVESTIGATIONS IN EASTERN ANTARCTIC,
by N. R. Paleev. 24 Jul 64, 12p
FTD TT64 291, TT 71319

Unclassified report

Unedited rough draft trans. of Sovetskaya Antarkticheskaya Ekspeditsiya, 1955- (USSR) 1959, v. 2, p. 157-162.

Descriptors: (*Polar regions, Acclimatization), (*Acclimatization, Polar regions), Adaptation (Physiology), Pathology, Protective clothing, Arctic regions, Tropical regions, USSR.

Physiological investigations were intended to study man's acclimatization in the Antarctic. The purpose of the observations was to explain the following problems: (1) Does the human organism experience any changes under conditions of long-lasting work in the Antarctic and what kind of change; (2) Are such changes dangerous to normal vitality of the organism; (3) What factors do cause the changes; (4) How rapidly do these changes develop and for how long are they preserved after leaving the Antarctic (how long do the physiological or pathophysiological changes last); and (5) Do such displacement develop in the human organism under conditions of travelling in the tropics. On the basis of collected data, a comparative analysis was made of the process of acclimatizing in Central Arctic and in the Antarctic.

AD-605 487 Div. 16, 30
OTS Prices: HC $5.00/MF $1.00

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A MATHEMATICAL MODEL OF THE HUMAN BODY. Master's thesis,
by Ernest Patrick Hanavan, Jr. Aug 64, 169p
AFIT GA/Phys/64-3

Unclassified report

Descriptors: (*Mathematical models, Body), (*Body, Mathematical models), Anatomy, Anthropometry, Programming (Computers), Data processing systems, Programming Languages, Center of gravity, Center of Mass, Posture, Body weight, Geometric forms, Anatomical models, Euler's angles, Pressure suits, Astronauts, Space biology, Biophysics.

A 15 segment personalized mathematical model of the human body is designed using 25 anthropometric dimensions. Center of gravity, moments and products of inertia, principal moments, and principal axes are determined. Results for 66 subjects are compared with experimental data. Center of gravity is generally predicted within 0.7 inches, moments of inertia within 10 per cent. A generalized computer program to calculate inertial properties of any subject in any body position is described. The inertial properties of 5 composite subjects in 31 body positions are given in a design guide. IBM 7094 digital computer programs are included in appendices. (Author)

AD-605 550 Div. 16, 12, 32
OTS Prices: HC $2.00/MF $0.50

Aerospace Technology Div., Library of Congress, Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS, PT. A. BIOSCIENCES: COMPILATION OF ABSTRACTS. Rept. 18 on Soviet Developments in Life Support Systems.
1 Sep 64, 28p
ATD P64 52, TT 64 71326

Unclassified report

Surveys of Soviet-Bloc Scientific and Technical Literature.

Descriptors: (*Life support, Abstracts), (*Space medicine, USSR), (*Abstracts, Life support), Radioprotective agents, Radiobiology, Radiochemistry, Space biology, Tissues (Biology), Whole body irradiation, Hemopoeitic system, Electrocardiography, Cardiovascular system, Weightlessness, Radiation effects, Dosage, Laboratory animals.

The report is the eighteenth in a series reviewing Soviet developments in life support systems. It is based on materials made available at the Aerospace Technology Division in November and December 1963. Items are selected from Soviet open literature. The materials in

Rept. no. 22 on Soviet Developments in Life Support Systems.
2 Sep 64, 29p
ATD P64 54; TT 64 71428

Unclassified report

Surveys of Soviet-Bloc Scientific and Technical Literature.

Descriptors: (*Abstracting, Life support), (*Life support, Abstracting), (*Space medicine, USSR), (*Radiobilogy, USSR), Radiological dosage, Radiation sickness, Radioprotective agents, Whole body irradiation, Radiation effects, Chemical compounds, Tissues (Biology), Bone, Regeneration, Blood analysis, Cholesterol, Closed ecological systems.

The report is based on Soviet open literature available at the Aerospace Technology Division during March-April 1964. The materials in this series are grouped according to the following topics: Part A. Biosciences: space medicine and biology; space physiology; perceptual physiology; space psychology; space vehicle ecology; and survival conditions. Part B. Instrumentation.

AD-605 990 Div. 16
OTS Prices: HC $1.00/MF $0.50

Michigan State Univ., East Lansing.
SOME BIRTH-DEATH AND MUTATION MODELS FOR PHAGE REPRODUCTION,
by J. Gani and G. F. Yeo. 4 Sep 64, 18p
RM-118-JG1
Contract Nonr2587 05

Unclassified report

Prepared in cooperation with Yale Univ.

Descriptors: (*Bacteriophages, Reproduction (Physiology), (*Mutations, Mathematical models), Birth, Mutations, Bacteria, Proteins, Desoxyribonucleic acids, Infections, Probability, Reproduction (Physiology), Partial differential equations.

Several models for phage reproduction within a bacterium have recently been discussed by Steinberg and Stahl (1961), Gani (1962) and Ohlsen (1963); all are effectively birth-death type processes, with the first of these considering a single type of phage mutation. A detailed description of the biological processes involved may be found in Adams (1959), Weidel (1959), Sanders (1961) and Smith (1961). Some general models extending that of Steinberg and Stahl in which mutation may take place from normal a phages to mutant phages A are considered in this study.

AD-606 034 Div. 16
OTS Prices: HC $0.50/MF $0.50

Chicago Univ., Ill. Medical School.
EFFECTS OF WHOLE-BODY VIBRATIONS ON PLASMA AND URINARY CORTICOSTEROID LEVELS IN MAN.
Rept. for Dec 60-Feb 63,
by Ben B. Blivaiss, Edward B. Magid, and Renato Litta-Modignani. Jun 64, 18p
Contract AF33 616 6889, Proj. 7231, Task 723101
AMRL TDR64 53

Unclassified report

Descriptors: (*Vibration, Corticosteroid agents), (*Corticosteroid agents, Vibration), Blood plasma, Urine, Adrenal glands, Thyroid glands, Adrenal cortex hormones, Tolerances (Physiology), Stress (Physiology), Steroids, Ketones, Metabolism, Space environmental conditions, Acceleration, Statistical analysis, Models (Simulations).

The effects on the hypophysio-adrenal and hypophysio-thyroid systems of whole-body vibration of the human for three 3-minute exposures separated by 1-1/2 minute rest periods at 1-20 cps were assessed through the determination of plasma 17-hydroxycorticosteroids (17-OH-CS) and protein-bound iodine (PBI) and of urinary adrenal cortex steroids. The levels of vibration were estimated three-minute tolerance values for the various frequencies. Blood and urine samples were collected at corresponding times on the control day and on the experiment day. Plasma 17-OH-CS levels were lower than control values ($P < 0.05$) immediately after vibration at 5, 6, and 7 cps and at 5 hours after vibration ($P < 0.01$). There was a significant decrease in the urine excretion of the blue tetrazolium reducing steroids at 1, 2, and 3 cps, and in 17-ketogenic steroids at 18, 19, and 20 cps. At 5, 6, and 7 cps there were significant changes in all steroids studies. Serum protein-bound iodine showed no significant differences when compared to control day. Alterations in blood and urine levels of steroids, while of statistical significance, are still considered within normal limits. (Author)

AD-606 054 Div. 16
OTS Prices: HC $0.50/MF $0.50

Chicago Univ., Ill. Medical School.
ENDOCRINE AND METABOLIC RESPONSE OF DOGS TO WHOLE-BODY VIBRATION.
Rept. for Dec 59-Feb 63,
by Ben B. Blivaiss, Renato Litta-Modignani, Giorgio Galansino, and Piero P. Foa. Jun 64, 20p
Contract AF33 616 6889, Proj. 7231, Task 723101
AMRL TDR64 54

Unclassified report

Descriptors: (*Endocrine glands, Vibration), (*Metabolism, Vibration), (*Vibration, Adrenal cortex hormones), Anesthesia, Corticosteroid agents, Epinephrine, Serotonin, Levarterenol, Adrenal glands, Glucose, Blood, Hematocrit, Stress (Physiology), Dogs.

To determine the endocrine and metabolic response of restrained dogs to whole-body vibration, pentobarbital anesthetized and non-anesthetized dogs were vibrated along the z axis while restrained in dorsal recumbency After vibration of anesthetized dogs at either 4 cps, 0.4 g for 30 minutes or 2 hours, or at 10 cps, 2.3 g for 2 hours, there was an average increase of 4.08 mcg 17 hydroxycorticosteroids (17-OH-CS) per 100 ml plasma and a significant increase in blood epinephrine but not serotonin or norepinephrine. Shaking at 4 cps, 1.7 g for 30 minutes produced less of a change in plasma 17-OH-CS than at 0.4 g. However, shaking at 4 cps for 6 hours led to greater increase in plasma 17-OH-CS at 1.7 g than 0.4 g. Non-anesthetized dogs shaken at 4 cps for 30 minutes had a greater increase of plasma 17-OH-CS than similarly shaken anesthetized dogs. Possible mechanisms for alterations in endocrine function are discussed. (Author)

AD-606 089 Div. 16, 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
NUMERICAL SOLUTION OF FUNCTIONAL EQUATIONS BY MEANS OF LAPLACE TRANSFORM. VIII: DETERMINATION OF WEIGHTING FUNCTIONS,
by Richard Bellman, Robert Kalaba, and Jo Ann Lockett. Sep 64, 8p RM-4213-NIH
Grant NIH GM09608 03

Unclassified report

Descriptors: (*Biochemistry, Numerical methods and procedures), (*Equations, Integral transforms), Functions, Numerical analysis, Tracer studies.

severe lesions are discussed clinically and histologically. A method of photographing the burn lesion during production has led to a better understanding of the pathogenesis of thermal injury to the retina. The threshold dose for minimal lesions was determined by the method of probit analysis. The influence of various factors such as rate of delivery, image size, and pulse shape was studied. The data are discussed in terms of the retinal burn hazard from atomic weapons and with reference to possible clinical applications, such as treatment of retinal detachment and tumors of the retina. (Author)

AD-605 906 Div. 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CHANGES OF PULMONARY BLOOD VESSELS IN CHRONIC RADIATION SICKNESS,
by I. S. Amosov. 10 Mar 64, 16p
FTD MT63 223; TT 64 71383

Unclassified report

Edited machine trans. of Meditsinskaya Radiologiya (USSR) 1962, v. 7, no. 4, p. 57-64.

Descriptors: (*Radiation sickness, Blood vessels), (*Blood vessels, Radiation sickness), Blood circulation, Lungs, Respiratory system, Morphology (Biology), Diseases, Pathology, Cardiovascular diseases, Radiological dosage, Medical examination, X-ray photography, Radiation injuries, Veins, Arteries, Tissues (Biology), Anemias, USSR.

During chronic radiation sickness appear functional and anatomical changes of the blood vessels of the lungs, which are developed in accordance with general process of the disease. These disturbances, expressed in periods of intensification and remissions that quiet down somewhat with time, can be revealed during angiocardiography. In the initial period of disease in connection with dystonia, developed in contraction of big vessels and dilation of the samll vessels, there appear sections of delayed blood circulation (hypostases) and is established an accelerated rhythm of motion of the contrast medium in the vessels of the lungs. During intensification of the illness there can appear obturation of the small or longer arteries. Blood circulation in the vessels of the lungs is accelerated due to the dilation of the artery-venous anastomoses. In later periods there is an increase of contraction of the pulmonary arteries, depletion of the network of small vessels, emphsema and radiation fibers of lungs. In the periods of remissions the characteristics of vascular circulator dystonia are absent or are weakly expressed, but the unusual flow of contrast medium from the arteries into the pulmonary veins remains, passing by the phase of capillary congestion. In the surving animals recanalization can set in the obturated pulmonary vessels. (Author)

AD-605 946 Div. 16
OTS Prices: HC $4.00/MF $1.00

Army Chemical Research and Development Labs., Edgewood Arsenal, Md.
ENERGETICS AND RESPIRATORY METABOLISM OF MUSCULAR CONTRACTION.
Rept. for 14 Feb-31 Dec 63,
by Bertram Sacktor. Aug 64, 141p
Proj. 1A012501B028
CRDL SP2 57

Unclassified report

Descriptors: (*Muscles, Metabolism), (*Metabolism, Muscles), Respiration, Energy, Chemical reactions, Organic compounds, Morphology (Biology), Flight, Birds, Insects, Oxygen, Glycogen, Glycolysis, Carbohydrates, Enzymes, Phosphorylation, Lipids, Amino acids, Chemical bonds, Biochemistry.

The energy used by insect muscle in maintenance of tension and performance of work that, at times, can total more than a million successive wingbeats with rates over a thousand contractions per second is ultimately derived from chemical reactions going on within the muscle. The nature of these reactions is the subject of this report. It is proposed in the sections that follow to (1) examine the magnitude of energy expenditure by active muscle, (2) describe the mobilization of energy-rich reserves and their catabolism in muscle, (3) detail the chemical reactions that conserve chemical-bond energy and provide the contractile elements with energy in a readily utilizable form, and (4) discuss some biochemical-morphological interrelation-ships in functionally different muscles.

AD-605 969 Div. 16, 32
OTS Prices: HC $2.00/MF $0.50

Institute of Contemporary Russian Studies, Fordham Univ., New York.
SOVIET BIOMEDICAL JOURNALS: SELECTED ABSTRACTS SERIES II, NO. 6,
comp. by Robert Pollitzer. Jul 64, 47p
Contract DA18 108 405CML867A
TT 64 71427

Unclassified report

Descriptors: (*Bibliographies, Microbiology), (*Abstracting, Microbiology), (*Microbiology, Abstracting), Microorganisms, Parasites, Parasitic diseases, Viruses, Immunity, Antigens and antibodies, Epidemiology, Insects, Diseases, Arboviruses, Ticks, Animals, Insecticides, Vaccines, Pasteurella, USSR.

Included in the compilation are abstracts on parasitology, microbiology, bacteriology, virology, immunology, and epidemiology.

AD-605 971 Div. 16
OTS Prices: HC $1.00/MF $0.50

Institute of Contemporary Russian Studies, Fordham Univ., New York.
A REVIEW OF SELECTED PROBLEMS OF TULAREMIA IN THE SOVIET UNION. Supplement,
by Robert Pollitzer. Sep 64, 17p
Contract DA18 108 405CML867A

Unclassified report

Descriptors: (*Pasteurella, USSR), (*Reviews, Pasteurella), Diseases, Vaccines, Ticks, Rodents, Siberia, Epidemiology, Immunity, Public health, Microbiology, Infections, Abstracting, Articles.

Articles on the problems of Tularemia in the Soviet Union are reviewed. Topics include: (1) incidence of the disease; (2) problems of immunization; and (3) general prophylaxis.

AD-605 973 Div. 16, 32
OTS Prices: HC $2.00/MF $0.50

Aerospace Technology, Div., Library of Congress, Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS. PT. A. BIOSCIENCES: COMPILATION OF ABSTRACTS.

17. Metallurgy

AD-605 134 Div. 17, 26, 27
OTS Prices: HC $2.00/MF $0.50

Westinghouse Electric Corp., Blairsville, Pa.
MANUFACTURING DEVELOPMENT OF TUNGSTEN ALLOYS FOR ROCKET NOZZLES. MID-YEAR REPORT ON PHASE II.
Rept. for 1 Jan-31 Jul 60,
by A. E. LaMarche. 1 Sep 60, 34p
Contract NOrd18791FBM

Unclassified report

Descriptors: (*Tungsten alloys, Rocket motor nozzles), (*Rocket motor nozzles, Tungsten alloys), (*Casting, Tungsten alloys), Tungsten, Molybdenum alloys, Castings, Casting alloys, Melting, Powder metallurgy, Vacuum furnaces, Manufacturing methods, Grain structures (Metallurgy), Purification, Salvage.

The vacuum arc skull casting of tungsten-molybdenum alloy rocket nozzles in thin configurations can be achieved. It is anticipated that modifications of the same techniques can be adapted to the casting of pure tungsten. The reclamation of the tungsten scrap generated in this development contract has been achieved with very promising results. The reclamation of the 50 tungsten - 50 molybdenum weight per cent solid solution alloy scrap has not, however, met with success. A definite relationship between the purity of the vacuum arc melting electrodes and the ability to vacuum arc melt and cast successfully has been established. The temperature of the tungsten arc has been calculated theoretically and confirmed in experimental melting to be in the order of 10,000 to 11,000F. In addition, the partition of power or the amount of power which is received by the cathode and the anode has been shown to be approximately seventeen times greater at the anode or bath than that received by the cathode or consumable electrode using D.C. straight polarity.

AD-605 157 Div. 17, 25
OTS Prices: HC $3.00/MF $0.50

Battelle Memorial Inst., Columbus, Ohio.
EFFECT OF ELECTRON CONCENTRATION ON MECHANICAL PROPERTIES OF ALLOYS OF REFRACTORY METALS.
Annual topical rept.,
by J. G. Booth. 17 Oct 63, 52p
Contract Nonr3589 00

Unclassified report

Descriptors: (*Refractory metal alloys, Physical properties), (*Rhenium alloys, Ductility), Chromium alloys, Rhenium alloys, Tungsten alloys, Molybdenum alloys, Grain boundaries, Phase studies, Hardness, Microstructure, Mechanical properties, Structural properties, Impurities, Solubility, Resistance (Electrical), Superconductivity, Magnetic properties, Cryogenics, Niobium alloys, Tantalum alloys, Transition elements, Transition temperature, Atomic orbitals.

The investigation has been concerned with the effects of additions of rhenium on the structural properties of the Group VI-A refractory metals. The term structural is taken to embrace both those properties which normally come under the heading of microstructure, and also those properties which are related to the electronic structure of these materials. In the present investigation the techniques were limited to magnetic-susceptibility measurements, electrical-resistivity measurements, and determinations of the superconducting transition temperatures. The report is divided into four sections as follows: (1) Grain-Boundary Studies, consisting of discussions on (a) Segregation of rhenium to grain boundaries, (b) Change in morphology of the grain-boundary phase, (2) Interstitial Solubility in the Chromium-Rhenium; (3) Electrical-Resistivity Measurements; (4) Magnetic-Susceptibility Measurements.

AD-605 203 Div. 17
OTS Prices: HC $1.00/MF $0.50

IIT Research Inst., Chicago, Ill.
VANADIUM ALLOY STUDIES.
Bimonthly rept. no. 3, 1 Jun-31 Jul 64,
by D. Weinstein and F. C. Holtz. 26 Aug 64, 10p
IITRI-B6021-3
Contract NOw64 0239c

Unclassified report

Descriptors: (Vanadium alloys, Creep), Niobium alloys, Tantalum alloys, Titanium alloys, Beryllium alloys, Hafnium alloys, Carbon alloys, Refining (Metallurgy), Material forming, Coatings, High-temperature research, Fracture (Mechanics), Ductility.

A vanadium alloy development program is being conducted for the purpose of producing improved short-time creep properties in the temperature range 2200 to 2400F. The composition V-40Cb-30Ta-1Ti presently represents the material having the best creep properties without a sacrifice of fabricability or coatability; on the basis of creep strain over a 2 hr period at 2200F, it is an order of magnitude better than any previous vanadium alloy. Work on modification of this composition using approaches to produce a stable, high-strength particle dispersion is continuing. (Author)

AD-605 283 Div. 17, 26
OTS Prices: HC $10.70/MF $3.25

Wright-Aeronautical Div., Curtiss-Wright Corp.,
Wood-Ridge, N. J.
RESEARCH ON THE BINARY IRON-NICKEL ALLOYS WITH 20 TO 25 PERCENT NICKEL.
Final engineering rept. for 1 Mar 61-30 Sep 62,
by E. P. Gilewicz, W. A. Fragetta, V. Mehra, and R. Krohn. Jun 64, 770p
Contract AF33 616 8018, Proj. 1 8 7381, Task 738103
ASD TDR62 996

Unclassified report

Report on Research on Binary Iron-Nickel Base Alloys; prepared in cooperation with the International Nickel Co.

Descriptors: (*Maraging steels, Mechanical properties), Tensile properties, Heat treatment, Iron alloys, Nickel alloys, Aging (Materials), Martensite, Forging, Welding, Fracture (Mechanics), Toughness, Cryogenics, Tests, Experimental data, Corrosion, Transformations, Hardness, Microstructure, Mechanical working, Phase studies, Welds, Sheets.

The physical metallurgy, mechanical properties and weld properties of the binary iron-nickel base alloys designated as Maraging Steels are presented. The primary data obtained during the program consisted of sheet and bar tensile properties as a function of various heat treatments and mill processing variables. Also determined were the fracture toughness parameters corresponding to strength levels produced by the various conditions mentioned above. Secondary data generated included elevated temperature tensile properties, billet and forging properties, room temperature fatigue properties and Charpy impact strengths at cryogenic temperatures. The results of the mechanical properties evaluation indicated that the best combination of

In a recent article, Beck and Rescigno point out that there are some important biochemical and physiological tracer experiments in which it is necessary to determine the weighting function k(t), given the input function f(t) and the output function u(t). The procedure given in their paper does not seem well suited to experimental or numerical work, since it depends upon the evaluation of various limits and derivatives of k(t). In this paper, the authors indicate how the procedures used in their previous papers based on the Laplace transform apply directly to this problem, and the significance of these procedures as far as experimental techniques are concerned. (Author)

stood if attention is focused on the growth of the crack which is responsible for the ultimate failure. One significant manner in which the present theory differs from others is that it invokes a stress dependent limiting condition on the crack growth to determine the cycles for failure. Representing the result of acoustic input as one of random stress response, expressions are derived for the prediction of time to failure. Indications are that the rate at which the damage is accruing in acoustic fatigue is strongly dependent upon the low stress end of the distribution function; and the failure conditions and the associated probabilities of failure are strongly determined by the high stress end; that is, the tail of the distribution function. Another important result of the analysis is that in any acoustic fatigue simulation tests, one has to take into account the design mean stress for which the structure is designed. This design mean stress not only influences the total time to failure but it also strongly affects the probabilities of failure by essentially changing the origin of the distribution function curve. (Author)

AD-605 597 Div. 17
OTS Prices: HC $1.00/MF $0.50

National Bureau of Standards, Washington, D. C.
DEPOSITION OF TUNGSTEN BY REDUCTION OF THE HEXAFLUORIDE WITH HYDROGEN IN THE VAPOR PHASE.
Quarterly rept. for 1 Feb-30 Apr 64,
by Jean H. Connor and Abner Brenner. 14 May 64, 12p
Contract AF33 615 64 05, Proj. 7312
Unclassified report

Descriptors: (*Tungsten, Vapor plating), (*Vapor plating, Tungsten), Tungsten compounds, Fluorides, Vapors, Reduction (Chemistry), Impurities, Hydrogen, Oxygen, Metal coatings, Density, Electrical properties, Tensile properties.

The previous report dealt with the equipment required for the study of the properties of tungsten deposited by the vapor phase method (See N64-21347). The development of equipment and devices for testing the properties of the deposits was continued, but the deposition of specimens of tungsten for test purposes was also initiated, and some measurements were made on the density and electrical resistivity. (Author)

AD-605 617 Div. 17, 26, 27
OTS Prices: HC $1.00/MF $0.50

North American Aviation, Inc., Downey, Calif.
MECHANICAL PROPERTIES OF 356-T6 CAST ALUMINUM ALLOY, AZ91C-T4 CAST MAGNESIUM ALLOY AND AZ91C-T6 CAST MAGNESIUM ALLOY AT ROOM TEMPERATURE AND -300 F,
by C. R. Waldron. 6 Jun 55, 20p AL-2158
Unclassified report

Descriptors: (*Casting alloys, Mechanical properties), (*Aluminum alloys, Mechanical properties), (*Magnesium alloys, Mechanical properties), Tensile properties, Compressive properties, Shear stresses, Impact shock, Low-temperature research, Deformation, Castings, Rocket motors, Pumps, Zinc alloys.

The use of magnesium alloys for pump castings in rocket motors is of interest because of the possible saving in weight. Mechanical properties data for cast magnesium alloy AZ91C and cast aluminum alloy 356-T6 at room temperature and -300 F are presented in this report. Cast aluminum alloy 356-T6 is being used in rocket motor pumps at the present time. (Author)

AD-605 618 Div. 17, 1
OTS Prices: HC $1.00/MF $0.50

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
MODULUS OF ELASTICITY OF Ti-8AL-1Mo-1V TITANIUM ALLOY,
by Donald A. Shinn. Sep 64, 14p MAA-TM-64-29
Proj. 7381, Task 738103
Unclassified report

Descriptors: (*Titanium alloys, Elasticity), Sheets, Loading (Mechanics), Airframes, Heat treatment, Tensile properties, Compressive properties, Experimental data, Aluminum alloys, Molybdenum alloys, Vanadium alloys.

The potential extensive applications of 8Al-1Mo-1V titanium alloy to major aircraft structures suggests that its properties be well substantiated. Several tests were therefore made to establish accurate values for the modulus of elasticity for this material. Data from three different sources, the majority of which was obtained with highly sensitive optical strain gages are reported. (Author)

AD-605 672 Div. 17
OTS Prices: HC $4.00/MF $1.00

Boeing Co., Renton, Wash.
INVESTIGATION OF THE EFFECTS OF STRESS CORROSION ON HIGH-STRENGTH STEEL ALLOYS,
Rept. for Jun 62-Dec 63,
by Gary A. Dreyer and Wesley C. Gallaugher. Feb 64, 148p
Contract AF33 657 8705, Proj. 7381, Task 738103
ML TDR64 3
Unclassified report

Descriptors: (*Steel, Corrosion), (*Corrosion, Steel), (*Fracture (Mechanics), Steel), Stainless steel, Chromium alloys, Nickel alloys, Molybdenum alloys, Cobalt alloys, Sheets, Metal plates, Environmental tests, Tensile properties, Grain structures (Metallurgy), Cold working, Heat treatment, Welding, Protective treatments, Coatings, Microstructure, Alloys, Toughness, Fractography, Metallography, Surface properties, Hydrogen embrittlement, Sodium compounds, Chlorides, Stresses.

The stress corrosion susceptibility of several high strength steels has been evaluated by alternate-immersion laboratory testing in a 3.5-percent sodium chloride solution. The steels evaluated were the stainless steels AFC 77, AM 350, AM 355, and 17-4PH; the low alloy steels D6AC, 4335M, 4340, H-11, 4330M, and HY-Tuf; and the high nickel steels 18Ni-9Co-5Mo, 18Ni-7Co-5Mo, and 9Ni-4Co. The variables investigated were product form, grain direction, tensile strength level, stress level, cold working, ausforming, welding, and protective coatings. Detailed results relating stress corrosion susceptibility to the variables and alloys studied are included. Notch tensile and fatigue cracked fracture toughness testing was carried out for correlation with stress corrosion susceptibility. Optical microscopy, electron microscopy, and X-ray diffraction studies were made to supplement the mechanical property and stress corrosion testing. A literature survey of related stress corrosion test data is included. (Author)

AD-605 703 Div. 17
OTS Prices: HC $4.00/MF $0.75

IIT Research Inst., Chicago, Ill.
RESEARCH ON THE BASIC NATURE OF STRESS CORROSION FOR VARIOUS STRUCTURAL ALLOYS AT ROOM AND ELEVATED TEMPERATURE,
by F. A. Crossley. May 64, 102p IITRI-B6010-12
Contract AF33 657 10971, Proj. 7351, Task 735106

fracture toughness and yield strength were offered by the 18% nickel alloys at both the 250 and 300 KSI strength levels. A comparison of the alloys on the basis of weld tensile and fracture toughness properties indicate the 18% nickel alloys as exhibiting superior weldability. (Author)

AD-605 317 Div. 17
OTS Prices: HC $0.50/MF $0.50

Naval Research Lab., Washington, D. C.
ELECTRON PROBE MICROANALYSIS OF THE DIFFUSION SYSTEMS Beta-TITANIUM-VANADIUM, Beta-TITANIUM-NIOBIUM, AND CHROMIUM-VANADIUM.
Final rept.,
by R. E. Seebold. 14 Aug 64, 10p
Proj. RR002 02 41 4951
NRL 6141

Unclassified report

Descriptors: (*Diffusion, Composite materials), (*Niobium, Diffusion), (*Vanadium, Diffusion), (*Chromium, Phase studies), (*Titanium, Phase studies), High-temperature research, Microanalysis, Probes (Electromagnetic), Microstructure, Heat of activation, Differential equations, Statistical processes, Solid solutions, Titanium alloys, Vanadium alloys, Chromium alloys, Niobium alloys.

The diffusions of niobium and vanadium into pure Beta-titanium at 1100C have been studied. Concentration versus distance curves for these systems are similar to each other but are skewed and different in shape from the Gaussians expected in self-diffusion. At temperatures between 1050C and 1200C the curves for chromium-vanadium diffusion do approximate Gaussians. Diffusion coefficients for all three systems have been calculated by Matano's method at elemental concentrations from 5 atom-percent to 95 atom-percent. Logarithms of the diffusion coefficients D for Beta -titanium with both niobium and vanadium follow a reasonable straightline relationship with the atom-percent of the solute element. The D values range from 3.5 10 to the minus 12th power sq cm/sec at 95 atom-percent Nb to 7.0 x 10 to the minus 10th power sq cm/sec at 5 atom-percent Nb, and from 4.5 x 10 to the minus 11th power sq cm/sec at 95 atom-percent V to 5.0 x 10 to the minus 9th power sq cm/sec at 5 atom-percent V. Calculated D values for Cr-V at 1050C, 1100 C, and 1200C are 4.5 x 10 to the minus 14th power, 1.3 x 10 to the minus 13th power, and 5.6 x 10 to the minus 12th power sq cm/sec respectively. A frequency factor, D sub O of 6±4 sq cm/sec and an activation energy, Q, of 71±4 kcal/g atom were also calculated for Cr-V. (Author)

AD-605 373 Div. 17, 27
OTS Prices: HC $2.00/MF $0.50

Defense Metals Information Center, Columbus, Ohio.
MECHANICAL AND PHYSICAL PROPERTIES OF THREE SUPERALLOYS, MAR-M200, MAR-M302, AND MAR-M322,
by John A. VanEcho and Ward F. Simmons.
6 May 64, 36p DMIC M193
Contract AF33 615 1121, Proj. 8975

Unclassified report

Descriptors: (*Nickel alloys, Physical properties), (*Cobalt alloys, Physical properties), (*Heat-resistant metals and alloys, Physical properties), Chromium alloys, Tungsten alloys, Tantalum alloys, Niobium alloys, Titanium alloys, Aluminum alloys, Zirconium alloys, Mechanical properties, Experimental data, Chemical analysis, Tensile properties, Elasticity, Stresses, Thermal conductivity, Specific heat, Alloys, Turbine parts, Gas turbine blades.

This memorandum deals with the mechanical and physical properties of three superalloys for elevated-temperature service. One of these, MAR-M200, is a nickel-base alloy and the other two, MAR-M302 and MAR-M322, are cobalt-base alloys. A request for data was made to several laboratories known to have tested experimental lots of the three alloys. The first section (Chemical Compositions and Physical Properties) contains general information on all three alloys. The second section (Data Curves) contains plots of the raw mechanical- and physical-property data. The third section contains the raw-data sheets as obtained from the contributors. The MAR-M200 alloy was designed for severe operating conditions primarily as blades and vanes in gas-turbine applications. The MAR-M302 alloy was designed primarily for use as a first-stage nozzle guide-vane material in advanced engines. The MAR-M322 alloy may find use as turbine-blade material as well as a guide-vane alloy because of its increased strength. (Author)

AD-605 375 Div. 17, 25, 31
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
TESTS OF MACHINED HIGH-STRENGTH STEEL SPHERICAL SHELLS SUBJECTED TO EXTERNAL HYDROSTATIC PRESSURE.
Research and development rept.
by Albert E. Dadley. Aug 64, 28p
Proj. S F013 03 02
DTMB 1854

Unclassified report

Descriptors: (*Steel, Pressure vessels), (*Hemispherical shells, Hydrostatic pressure), (*Spheres, Structural shells), Model tests, Elasticity, Buckling (Mechanics), Compressive properties, Failure (Mechanics), Stresses, Submarine hulls, Structures, Pressure, Mathematical analysis, Design, Cylindrical bodies, Thickness.

Six structural models, consisting of hemispherical shells bounded by ring-stiffened cylinders designed to provide ideal boundary conditions, were hydrostatically pressure-tested to collapse. The models were accurately machined from high-strength steel (STS) and were designed to investigate both elastic and inelastic buckling modes of collapse. The results of the tests are compared with theory, and the collapse pressures agree within ± 7 percent of those computed by the TMB empirical buckling equation. A nondimensional plot of experimental results is presented for the models tested. Based on the plot, a simple design method is given for similar accurately machined thin spherical shells. (Author)

AD-605 408 Div. 17
OTS Prices: HC $3.00/MF $0.50

Norair Div., Northrop Corp., Hawthorne, Calif.
SIMULTANEOUS APPLICATION OF STATIC AND DYNAMIC LOADS ON SONIC FATIGUE TEST ARTICLES. SUPPLEMENT 1. CONSIDERATIONS OF THE THEORETICAL ASPECTS OF ACOUSTIC FATIGUE.
Rept. for Jun 62-Jun 63,
by S. R. Valluri. Jun 64, 51p NOR-63-196
Contract AF33 657 8757, Proj. 4437, Task 443703
RTD TDR63 4021 S1

Unclassified report

Descriptors: (*Metals, Failure (Mechanics)), (*Sonic fatigue, Theory), Fracture (Mechanics), Loading (Mechanics), Stresses, Statistical functions, Probability, Statics, Dynamics.

A theory of acoustic fatigue is proposed which is based on a general theory of fatigue of metals. The theory is based on the proposition that the problem is better under-

AD-605 862 Div. 17, 26, 27
OTS Prices: HC $7.95/MF $2.25

Aerojet-General Corp., Sacramento, Calif.
EVALUATION OF HIGH NICKEL STEEL FOR APPLICATION IN LARGE BOOSTER MOTOR FABRICATION.
Summary rept., for 31 May 62-31 Jan 64,
by R. E. Anderson and P. P. Crimmins. Apr 64, 492p
Contract AF33 657 8740, Proj. 7381, Task 738101
ML TDR64 115

Unclassified report

Descriptors: (*Maraging steels, Rocket motors (Solid propellant)), (*Rocket motors (Solid propellant), Maraging steels), Booster motors, Nickel alloys, Tensile properties, Aging (Materials), Fracture (Mechanics), Toughness, Metal plates, Metallurgy, Melting, Processing, Microstructure, Impurities, Grain structures (Metallurgy), Chemical analysis, Forging, Welding, Welding rods, Rolling (Metallurgy), Rocket cases, Titanium alloys, Cobalt alloys, Molybdenum alloys, Mechanical properties, Experimental data.

The tensile, aging response, and fracture toughness properties of seven heats of 18% nickel maraging steel plate and bar stock with yield strength values ranging from 200 to 300 ksi were evaluated during a 20-month study program, and the results of this investigation were correlated with material melting and processing practices. The grain size, general microstructure, inclusion content and banding characteristics of these heats of material were determined. Relationships between yield strength, fracture toughness, and alloy composition were established. Based on the results of this program, an optimum 18% nickel maraging steel was selected for the fabrication of large-diameter booster motors and evaluated in the form of 3/4-in.-thick plate and 1 x 4-in. and 4 x 4-in. ring forgings. Tensile, aging response, fracture toughness, and metallurgical properties of the optimum material were evaluated. TIG and MIG welding studies were also conducted using the 3/4-in.-thick plate material and the weldment tensile, fracture toughness, chemical composition, and metallurgical properties were established. (Author)

AD-605 873 Div. 17, 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE INFLUENCE OF ULTRASOUND ON THE MECHANICAL PROPERTIES OF COPPER,
by I. V. Chernenko and V. S. Cherkashin. 14 Nov 63, 12p
FTD MT63 155; TT 64 71397

Unclassified report

Edited machine trans. of Primenenie Ul'traakustiki k Issledovaniyu Veshchestva (USSR) 1960, no. 12, p. 141-145.

Descriptors: (*Copper, Ultrasonic radiation), (*Ultrasonic radiation, Copper), Mechanical properties, Temperature, Plasticity, Brittleness, Resistance (Electrical), Grain boundaries, Microstructure, Hardness, USSR, Heat treatment.

Red copper, subjected to the influence of ultrasonic oscillations by 19.5 kilocycle frequency at temperatures of 600-700 degrees in 15-20 minutes, changes from the plastic state into a brittle state. The increase of temperature and increase of scoring time causes decrease of durability and plasticity during simultaneous lowering of the microhardness. The electric resistance of copper is significantly increased during the increase of time and temperature scoring. The action of ultrasound on copper at increased temperatures manifests in the appearance of micro-cracks on grain boundaries which culminates to the subsequent brittle destruction at room temperature. The scoring of copper at temperatures of 100 to 300 degrees in 20 minutes causes lowering of the durability without lowering its plasticity. The scoring of the same duration at temperatures lower than 100 degrees does not cause visible changes of properties and structure in copper. (Author)

AD-605 874 Div. 17, 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE CALCULATION OF A THICK-WALLED NON-UNIFORM PIPE,
by M. M. Plotnikov. 13 Dec 63, 14p
FTD MT63 145; TT 64 71398

Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Mashinostroenie (USSR) 1960, no. 12, p. 104-109.

Descriptors: (*Pipes, Elasticity), Stresses, Thickness, Differential equations, Anisotropy, USSR.

This work considers the flat stress condition in an anisotropic nonuniform pipe, subject to the action of internal and external pressures when the elastic modulus varies by a hyperbolic and exponential law. When the elastic modulus varies by hyperbolic law an asymptotic solution is obtained and when it varies by exponential law, the solution is obtained in a closed form.

AD-605 881 Div. 17
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CORROSION STABILITY OF LOW-CARBON AND LOW-ALLOY STEELS IN SEA WATER,
by G. G. Koshelev and I. L. Rozenfel'd. 30 Dec 63, 24p
FTD MT63 125; TT 64 71405

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR, Institut Fizicheskoi Khimii. Trudy, 1960, v. 8, p. 333-344.

Descriptors: (*Steel, Corrosion), (*Corrosion, Steel), (*Sea water, Corrosion), Alloys, Carbon alloys, Environmental tests, Chromium alloys, Nickel alloys, Copper alloys, Manganese alloys, Mechanical properties, Heat treatment, USSR.

The average speed of corrosion in the sea of the tested steels is almost identical. Consequently, alloying by small additions of Cr, Ni, Cu, and Mn does not increase corrosion resistance of the steel in the sea to a noticeable degree. Low-alloy steels differ from carbon by the fact that they corrode less evenly in the sea. This promotes a somewhat large loss of their mechanical properties (by 5--8%, as compared with Steel 3). (Author)

AD-605 886 Div. 17
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE MECHANICAL PROPERTIES OF SOME INTERMETALLIC COMPOUNDS AND PHASES,

ASD TR61 713 P3

Unclassified report

Descriptors: (*Aluminum alloys, Corrosion), (*Stainless steel, Corrosion), (*Titanium alloys, Corrosion), (*Corrosion, Stresses), Anisotropy, Chromium alloys, Life expectancy, Grain structures (Metallurgy), Fracture (Mechanics), Tensile properties, Heat treatment, Temperature, Sea water, Chlorides, Sheets, Steel, Molybdenum alloys, Vanadium alloys, Environmental tests, Microstructure.

Wrought, high-strength aluminum alloys characteristically have markedly inferior resistance to stress corrosion in the short-transverse direction relative to resistance in the longitudinal and long-transverse directions. The anisotropy of resistance has been shown to be due to marked anisotropy of microstructure. Investigation of experimental and commercial 1 in. plate showed that the elongated, plate-like grain structure usually found in commercial materials was associated with short life while equiaxed or irregular grain structure was associated with significantly longer life. Excess alloy content resulting in second-phase particles in the microstructure contributes to the development of the undesirable elongated grain structure. Exposure at 650F under stress for times of 1400 or 2000 hr gave no indication that the steels PH 13-8 Mo and PH 14-8 Mo are susceptible to hot salt stress corrosion. Experiments to determine the kinetics of hot salt stress-corrosion cracking of Ti-8Al-1Mo-1V alloys are described. Cracking was observed at 500F, 50F lower than the lower temperature limit reported in prior investigations. (Author)

AD-605 716 Div. 17, 26
OTS Prices: HC $2.00/MF $0.50

Defense Metals Information Center, Columbus, Ohio.
MARAGING-STEEL PROJECT REVIEW (4th),
by A. M. Hall and J. E. Campbell. 19 Aug 64,
27p DMIC-M-196
Contract AF33 615 1121, Proj. 8975

Unclassified report

Held in Dayton, Ohio, 9-11 Jun 64.

Descriptors: (*Maraging steels, Reports), Nickel alloys, Melting, Processing, Cold working, Toughness, Fracture (Mechanics), Pressure vessels, Mechanical properties, Physical properties, Corrosion, Stresses, Hydrogen embrittlement, Joining, Welding, Abstracts.

This memorandum summarizes the Fourth Maraging-Steel Project Review which was held on June 9 to 11, 1964, in Dayton Ohio. During the sessions, twenty-one scheduled and several unscheduled presentations were made by representatives of Government agencies, industrial concerns, and universities. Abstracts of these presentations are included in this memorandum preceded by a summary of the highlights of the various technical developments. Session I dealt with the mechanical properties of maraging steels. The remaining four sessions dealt with general maraging-steel evaluations, mechanical properties of welds and fabrication of 18 per cent nickel maraging steels, fabrication and characteristics of maraging steels, and alternate motor-case materials. During the past year, considerable effort has been expended to resolve certain technical problems relating primarily to 18 per cent nickel maraging-steel plate which has been under consideration for large booster cases. Among these problems have been banding and the resultant low short-transverse mechanical properties, associated with mill processing variables. The results of the research programs presented at this meeting shed much light on these and other problems and indicate that considerable progress has been made toward overcoming the production and fabrication problems of the maraging steels and other high-strength steels. (Author)

AD-605 805 Div. 17
OTS Prices: HC $2.00/MF $0.50

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
THE FLOW AND FRACTURE OF ZONE REFINED TUNGSTEN.
Final rept.,
by G. J. London. Apr 64, 36p F-B1973
Contract DA36 034ORD3747RD, Proj. 59332008
WAL TR834 2 11 3

Unclassified report

Descriptors: (*Tungsten, Zone melting), (*Zone melting, Tungsten), Purification, Induction heating, Resistance (Electrical), Fracture (Mechanics), Tensile properties, Stresses, Impurities, Electron beams, Tests, Crystals, Microstructure, Refining (Metallurgy), Tungsten alloys.

This report covers the first efforts toward purification of tungsten by induction floating zone melting. The difficulties encountered in initial melting efforts were poor visibility and inadequate zone length control. The former was overcome by using a preliminary solid state vacuum outgassing treatment. The latter difficulty was partly solved with the use of a levitation type melting coil to support the molten zone. Tensile specimens were prepared by spark and chemical machining techniques. Specimens were tested with three electron beam zone passes, one induction zone pass, and three electron beam followed by four induction zone passes. The critical resolved shear stresses decreased in the order listed above, with the one induction zone pass material showing lower CRSS than the three electron beam zone pass material. The tensile results are considered encouraging, but the relatively poor induction zone melting conditions attained prevented a full evaluation of this process. (Author)

AD-605 832 Div. 17, 25, 26
OTS Prices: HC $2.00/MF $0.50

Linde Div., Union Carbide Corp., Indianapolis, Ind.
GROWTH OF SINGLE CRYSTAL TUNGSTEN TO BE USED FOR ROLLING INTO SINGLE CRYSTAL SHEET.
Quarterly progress rept. no. 2, 1 Jun-31 Aug 64,
by F. R. Charvat and G. W. Edwards. 28 Aug 64, 50p
Contract NOw64 0055c

Unclassified report

Report on Fabrication and Properties of Tungsten Single Crystals. Rept. includes Single Crystal Tungsten Sheet, Technical rept. for 1 May-31 Aug 64; Philco Research Labs. pub. no. U-2773.

Descriptors: (*Tungsten, Single crystals), (*Single crystals, Tungsten), (*Crystal growth, Single crystals), (*Rolling (Metallurgy), Single crystals), (*Sheets, Single crystals), Machining, Crystallography, Impurities, Deformation, Crystal lattices, Hardness, Tensile properties, Ductility, Stresses, Recrystallization.

Twenty-four tungsten crystals were grown by the Arc-Verneuil method from which 7 were selected for machining into rectangular billets on the basis of minimum crystal misorientation and deviation of crystal orientation from cylindrical axis. Chemical analysis of the finished billets for interstitial and metallic impurities showed satisfactory low levels. The slip systems activated during the deformation of tungsten single crystals by rolling at 10% per pass and 1000C were investigated by means of (A) macroscopic dimensional changes of the billets, (B) Laue back-reflection photographs, (C) Vickers hardness measurements, and (D) dislocation etch-pit techniques.

this technique is also being employed in steel construction. In this application faultless spot-welds are mandatory. Similar conditions prevail also in the field of aircraft and vehicle manufacture, where the joints are subjected predominantly to dynamic stresses. The problem of economical quality control is an especially important one in the field of aircraft manufacture, where the requirements imposed on the quality of the welds in the components are high. A method for the testing of spot-welds which is based on the penetration of the item to be tested by ultrasonic radiation is described.

AD-606 079 Div. 17, 1
OTS Prices: HC $1.00/MF $0.50

Michigan Univ., Ann Arbor, Coll. of Engineering.
EFFECT OF 12,000-HOUR CREEP EXPOSURE ON STRUCTURAL SHEET MATERIALS,
Progress rept. no. 7,
by T. M. Cullen and J. W. Freeman. Jun 64, 10p
ORA-04583-35-P
Contract AF33 616 8334, Proj. 1 8 7381, Task 73812
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Creep, Stainless steel), (*Stainless steel, Sheets), (*Sheets, Stainless steel), Chromium alloys, Nickel alloys, Molybdenum alloys, Mechanical properties, Tensile properties, Hardness, Stresses, Supersonic planes, Transport planes, Ductility, High temperature research, Aircraft, Structural parts, Aging (Materials).

AD-606 108 Div. 17
OTS Prices: HC $3.00/MF $0.75

Monsanto Research Corp., Dayton, Ohio.
ELEVATED TEMPERATURE TENSILE AND CREEP PROPERTIES OF M-252 (BAR), INCONEL 700 (BAR), AND INCONEL 713 (CAST) NICKEL BASE ALLOYS,
by Sidney O. Davis. Jul 64, 78p
Contract AF33 616 8483, Proj. 7381, Task 738103
ML TDR64 79
Unclassified report

Prepared in cooperation with Joliet Metallurgical Labs., Inc., Ill., Contract AF33 600 36462.

Descriptors: (*Nickel alloys, High temperature research), (*Tensile properties, Nickel alloys), (*Creep, Nickel alloys), Cobalt alloys, Chromium alloys, Molybdenum alloys, Titanium alloys, Aluminum alloys, Niobium alloys, Carbon alloys, Castings, Rods, Aging (Materials), Deformation, Time, Stresses.

Room and elevated temperature tensile and elevated temperature creep properties to 1000 hours were determined at three representative application temperatures for M-252 (bar), Inconel 700 (bar), and Inconel 713 (cast). Tabulated tensile and creep data, deformation versus time curves and stress versus time curves for 0.1, 0.3, 0.5, and 1% creep are presented. (Author)

AD-606 121 Div. 17, 14
OTS Prices: HC $1.00/MF $0.50

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
NOTE ON THE TRANSIENT OSCILLATIONS OF A SYSTEM INCORPORATING HYSTERETIC DAMPING,
Rept. for Jan-Apr 64,
by D. I. G. Jones. Jul 64, 16p
Proj. 7351, Task 735106
ML TDR64 244
Unclassified report

Descriptors: (*Viscoelasticity, Harmonic analysis), (*Damping, Oscillation), Metals, Loading (Mechanics), Shear stresses, Strain (mechanics), Hysteresis, Numerical analysis, Equations, Motion, Integral transforms, Special functions (Mathematical).

The motion of a single degree of freedom viscoelastic system subsequent to an initial impulse is discussed. The logical difficulties inherent in the extension of the 'complex modulus' concept to transient motions are highlighted but it is shown that for currently available materials, for which the loss factor mu rarely exceeds 0.5, these difficulties do not arise. It is found that no solution exists for mu > 1. (Author)

AD-606 138 Div. 17
OTS Prices: HC $4.00/MF $0.75

Fritz Engineering Lab., Lehigh Univ., Bethlehem, Pa.
PLASTIC DESIGN IN HIGH STRENGTH STEEL: EXPERIMENTS ON HIGH STRENGTH STEEL MEMBERS,
by Peter F. Adams, Maxwell G. Lay, and Theodore V. Galambos. Jul 64, 109p Fritz-297.8
Unclassified report

Sponsored jointly by the Welding Research Council and the Department of the Navy.

Descriptors: (*Steel, Physical properties), (*Beams (Structural), Steel), Tensile properties, Plasticity, Design, Test methods, Hardening, Strain (Mechanics), Stresses, Moments, Deformation, Rolling (Metallurgy), Structural parts.

The report describes tests performed on members of ASTM A441 steel. The testing program included basic material property tests, beam tests under uniform moment and moment gradient as well as beam-column tests. The results of the tests are presented and discussed. (Author)

AD-606 139 Div. 17
OTS Prices: HC $1.00/MF $0.50

Republic Aviation Corp., Farmingdale, N. Y.
METALLIC BOSS SEAL EVALUATION AND TEST PROGRAM,
Bi-monthly progress rept. no. 5, 1 Jan-1 Mar 61,
by S. Cannizzaro. 15 Mar 61, 21p RAC-682-626(268)
Contract AF33 616 7297, Proj. 0 2 3145, Task 61085
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Metal seals, Performance (Engineering)), (*Stainless steel, Metal seals), Titanium, Aluminum, Carbon, Tensile properties, Thermal stresses, Vibration, Tests.

Thermal cycling tests using NAVAN stainless steel seals in stainless steel assemblies showed good performance during the first two series of thermal cycles; however, performance decreased in subsequent tests apparently as a result of disassembly and reassembly between series. Thermal cycling tests using 1/4-inch aluminum unions indicated that the unions could withstand an operating pressure of 2000 psi at 400F but failed at an operating pressure of 4000 psi. Titanium unions assembled in stainless steel bosses with NAVAN stainless steel tees showed satisfactory performance in thermal cycling tests. Repeated assembly tests showed that although the NAVAN aluminum seals withstood a higher tightening torque than the USAF X59C6184 seals, the sealing ability of the latter at lower torque values was equal to that of the NAVAN seal. Vibration test results on assemblies made up of combinations of aluminum and carbon steel and with NAVAN and X59 aluminum seals showed satisfactory performance at room temperature and at 400F. (Author)

by E. M. Savitskii. 7 Apr 64, 22p
FTD MT63 260; TT 64 71410

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Sektor Fiziko-khimicheskogo Analiza, Izvestiya, 1949, v. 19, p. 419-428

Descriptors: (*Intermetallic compounds, Mechanical properties), (*Phase studies, Intermetallic compounds), Magnesium alloys, Zinc alloys, Aluminum alloys, Copper alloys, Deformation, Alloys, Brittliness, Hardness, USSR, Temperature.

Investigated alloys of the systems Mg -- Zn, Al--Mg and Cu -- Zn (up to 50% Zn). As initial materials electrolytic magnesium, zinc and copper were taken, and also technical aluminum (99.7% Al). The composition of alloys was controlled by chemical analysis.

AD-605 892 Div. 17, 14
OTS Prices: HC $3.00/MF $0.75

Tem-Pres Research, Inc., State College, Pa.
RESEARCH ON CRITERIA FOR SELECTION OF ALLOYS AND SURFACE TREATMENTS FOR INHIBITION OF TUNGSTEN OXIDATION. PART I. STUDIES ON THE CHEMICAL AND PHYSICAL PROPERTIES OF TERNARY PHASES CONTAINING TUNGSTEN AND OXYGEN.
Rept. for 1 Jul 63-30 Jun 64,
by Bert Phillips, Luke L. Y. Chang, and Margaret G. Scroger. Aug 64, 72p
Contract AF33 657 11235, Proj. 7312, Task 731201
ML TDR64 230, P1

Unclassified report

Descriptors: (*Tungsten, Oxidation), (*Oxidation, Tungsten), (*Phase studies, Tungsten alloys), (*Protective treatments, Tungsten), Titanium alloys, Calcium alloys, Samrium alloys, Cobalt alloys, Oxides, High-temperature research, Coatings, Antioxidants, X-ray diffraction analysis, Refractory metals, Transition temperature, Melting.

A study was made of reactions and equilibria as well as the properties of ternary phases which result, thermophysical and thermochemical properties of tungsten and tungsten-base alloy oxidation. Sealed capsules were used to equilibrate pelletized samples from which data were obtained on the condensed phase relations in the systems W-O, Ti-W-O, Ca-W-O, Sm-W-O, and Co-W-O. The system W-O up to 1700C (3090F) and isothermal sections for the ternary systems at 1400C (2550F) and 1700C (3090F) are presented. Because sealed sample containers were used during equilibration, data on the partial pressures of oxygen necessary for equilibrium and on the total pressures of the gas phase could not be obtained. Nevertheless, the positions of the oxygen isobars in the system W-O have been calculated from published thermodynamic data and extrapolations thereof, and generalities which are applicable to the ternary equilibria and which are governed by thermodynamics and the phase rule are stated. Similarly, the processes whereby changes in condensed phase assemblages occur as a function of oxidation of tungsten-metal alloys and mixtures are illustrated with examples. The ternary tungstates which are thermodynamically stable in the systems studied have been characterized as to x-ray diffraction pattern and melting temperature. Where possible, crystallographic information is also given. (Author)

AD-605 897 Div. 17, 4
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOLID SOLUTIONS OF METALLIC COMPOUNDS,
by I. I. Kornilov. 17 Mar 64, 12p
FTD MT63 172; TT 64 71418

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Doklady, 1951, v. 81, no. 4, p. 597-600.

Descriptors: (*Metallic crystals, Chemical compounds), (*Metals, Solid solutions), Crystal lattices, Alloys, Synthesis (Chemistry), USSR.

AD-606 001 Div. 17, 25
OTS Prices: HC $1.00/MF $0.50

Tapco Div., Thompson Ramo Wooldridge, Inc., Inglewood, Calif.
THE TEMPERATURE HISTORY OF PLATES OF ARBITRARY THICKNESS SUBJECTED TO CONSTANT HEAT INPUT ON ONE SIDE AND INSULATED ON THE OTHER SIDE,
by H. W. Baer. 1 Feb 57, 12p GM-TM145, EM-7-3

Unclassified report

Descriptors: (*Heat transfer, Metal plates), (*Metal plates, Heat transfer), Thermodynamics, Friction, Pressure, Thickness, Cobalt alloys, Chromium alloys.

The temperature history of plates of arbitrary thickness is evolved by considering them slabs subjected to constant heat input on one face and insulated on the other face. The heat input is brought about by sliding the plate under pressure and with constant velocity against another, larger plate. It is assumed that the friction coefficient as well as the diffusivity of the slab is not time-dependent. The mechanism is considered unsteady-state, one-dimensional heat transfer. The result of the computations is given in the form of a non-dimensional temperature vs. non-dimensional time relation with the following plate parameters: contact force, coefficient of sliding friction, face area, conductivity, sliding velocity, thickness, and diffusivity. The temperature history may be used to design plates for optimum allowable dissipation power values for a large variety of specified plate properties. The change of allowable dissipation with change of various parameters is shown in tabular form, based on an example of a stellite plate of 1/4 inch thickness. (Author)

AD-606 048 Div. 17
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
A NEW METHOD FOR THE NON-DESTRUCTIVE TESTING OF SPOT WELDS,
by Günter Wilkens. 3 Sep 64, 18p
RSIC 263; TT 64 71436

Unclassified report

Trans. of Mitteilungsblatt für die Amtliche Materialprüfung in Niedersachen, (West Germany) 1962/1963, no. 2/3, p. 28-31.

Descriptors: (*Ultrasonic radiation, Non-destructive testing) (*Spot welds, Non-destructive testing), (*Non-destructive testing, Spot welds), Loading (Mechanics), Stresses, Fracture (Mechanics), Test methods, West Germany.

The spot-welding technique, a process employed in almost all phases of metal processing, is being used for load-bearing and highly-stressed building components at an increasing rate. Since it became possible to join components up to 25 mm thick by means of spot-welding,

A portion of the research done at the Operations Research Center has consisted of developing new mathematical methods for the control of inventories. The objective of this work has been two-fold: namely, (1) in the theoretical mathematics constructed to accept whatever degree of mathematical sophistication appeared to emerge naturally as being required, (2) to develop the resulting methods to the point of practical usefulness sufficient to ensure their use by non-mathematically oriented personnel conducting the actual supply operation. As a result, an important fraction of the effort of the research staff has been devoted to working personally with the operating supply people.

AD-605 436 Div. 18, 26
OTS Prices: HC $4.00/MF $0.75

Arizona State Univ., Tempe. Coll. of Business Administration.
AN INVESTIGATION OF THE MANAGEMENT CONTROL SYSTEM OF THE STRATEGIC AIR COMMAND.
Master's thesis,
by Bennett Burns Zinnecker. Jul 64, 120p
Unclassified report

Descriptors: (*Management control systems, Strategic Air Command), (*Strategic Air Command, Management control systems), (*Tactical Air Command, Management control systems), Management planning, Air Force operations, Control systems, Military requirements, Costs, Maintenance, Measurement, Background, Effectiveness.

The purpose of this investigation and analysis is: (1) to describe the scope and operation of the Management Control System as used by the Strategic Air Command and the Tactical Air Command; (2) to outline the requirements of each of these commands for an integrated control system; (3) to appraise the efficiency and effectiveness of the Management Control System; (4) to examine the applicability of the system to other organizations; and (5) to suggest possible refinements and corrections to the system.

AD-605 454 Div. 18, 26
OTS Prices: HC $1.00/MF $0.50

American Ordnance Association, Washington, D. C.
FRINGE EFFECTS OF VALUE ENGINEERING. A SURVEY PREPARED BY THE TECHNICAL SUBCOMMITTEE, AOA SPECIAL COMMITTEE ON VALUE ENGINEERING FOR THE OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS).
May 64, 25p
Unclassified report

Descriptors: (*Logistics, Management engineering), (*Management engineering, Defense systems), (*Defense systems, Management engineering), Department of Defense, Installation, Costs, Reliability, Maintainability, Packaging, Industries, Statistical analysis.

The Department of Defense is currently taking steps to greatly increase the application of value engineering techniques to defense equipment and supplies. Since it is a widespread feeling among persons not directly involved in value engineering work that value engineering 'cheapens' a product and lowers its performance capabilities, it was requested that the American Ordnance Association undertake a study of representative items, arbitrarily selected, to determine whether or not this feeling was true. It was further suggested that the study document the impact in terms of such factors as reliability, maintainability and other fringe effects. The special committee on value engineering established the survey format and boundaries and actually applied value engineering principles to preparation of the survey. Some of the problems encountered in preparing this survey were ones of definition. For example, although it is clear what the difference is between a class I and a class II change to the individual contractor, it is possible that a class I change for a subcontractor would be a class II change for a prime contractor. The ground rules established to this problem were: if the change necessitated a modification to the prime contract, it was counted as a class I change. If the change did not require a contract modification to the prime contract, it was counted as a class II change.

AD-605 476 Div. 18, 28, 32
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SIMULATION OF DECISIONMAKING IN CRISES: THREE MANUAL GAMING EXPERIMENTS.
Memo. rept.
by H. Averch and M. M. Lavin. Aug 64, 46p
RM-4202-PR
Contract AF49 638 700
Unclassified report

Rept. on Proj. Rand.

Descriptors: (*National defense, Decision making), (*Decision making, Game theory), (*Game theory, Decision making), Political science, Defense systems, Military operations, Cold war, Arms control, Limited war, Public opinion, Behavior, Department of Defense, Europe, United States government, USSR.

Gaming techniques used in examining three hypothetical European crises occurring in the late 1960s are described. The aims in this gaming were to identify some of the political and military constraints that affect national decisionmaking during crises; to discern whether or not common patterns of action appear in different crises; and to infer military requirements in crises. On the basis of the recent gaming experience, observations and judgments are advanced about: (1) The effects of our three game structures on decisionmaking, and the quality and quantity of decisions in these games compared with decisions in real crises; (2) the escalation of violence in the games as opposed to that in real crises; (3) the impact of internal and external information flows on our game decisions; and (4) typical questions identified by these plays as deserving further study.

AD-605 484 Div. 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE ROLE OF AIRPOWER IN PROVIDING TACTICAL MOBILITY IN PAST COIN OPERATIONS,
by A. H. Peterson. Sep 64, 10p P-2968
Unclassified report

Paper is abstracted from information developed at Symposium: The Role of Airpower in Counter-insurgency and Unconventional Warfare, held at the RAND Washington Office, 14-18 January 1963.

Descriptors: (*Symposia, Aerial warfare), (*Aerial warfare, Unconventional warfare), (*Counterinsurgency, Aerial warfare), Air transportation. Limited war, Military tactics, Air force operations.

The objectives of the symposium were to collect relevant, detailed background information from examples of past counterinsurgency and unconventional warfare campaigns and to identify subjects suitable for further research. It

18. Military Sciences and Operations

AD-605 245 Div. 18, 32
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE AMERICAN AGGRESSORS IN SOUTH VIETNAM ARE HEADING TOWARD A COMPLETE DEFEAT,
13 Aug 64, 12p
FTD TT64 625; TT 64 71297

Unclassified report

Edited trans from Jen Min Jih Pao (Chinese People's Republic) 1964, 4 Mar.

Descriptors: (*Warfare, Vietnam), (*Military strategy, United States government), Armed forces operations, Political science, Propaganda, China.

AD-605 248 Div. 18, 30, 33
OTS Prices: HC $5.00/MF $1.00

RAND Corp., Santa Moncia, Calif.
BASE OPERATIONS-MAINTENANCE SIMULATOR,
by Allen S. Ginsberg and Barabara A. King. Sep 64, 166p RM-4072-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Military facilites, Air Force), (*Maintenance, Military facilities), (*Programming (Computers), Simulation), Computers, Programming languages, Strategic Air Command, Compilers, Monte Carlo method.

The Base Operations-Maintenance Simulator (BOMS), a computer program written in Simscript language, simulates the essential characteristics of an Air Force Base. It represents a SAC B-52/KC-135 organization, but can, with slight modifications represent most other single-base operations. Three separate computer programs which make up the BOMS are described. The Data Generator combines a flying schedule with random failures, generated by a Monte Carlo process, with the resources required for repair. This data, along with input parameters describing pertinent characteristics of the base, is fed to the Main Program. The Main Program simulates, in great detail, the minute-by-minute activities of the base. The Analysis Program summarizes the output of the Main Program and prints the reports.

AD-605 298 Div. 18, 1
OTS Prices: HC $2.00/MF $0.50

George Washington Univ., Washington, D. C.
A COMPARISON OF USAGE DATA AMONG AIRCRAFT TYPES,
by Sheldon E. Haber. 1 Sep 64, 50p T-174
Contracts Nonr761 03, Nonr761 05, Projs. NR345 107, NR047 001

Unclassified report

Rept. on Logistics Research Proj.

Descriptors: (*Naval aircraft, Spare parts), (*Replacement theory, Aircraft equipment), (*Logistics, Naval equipment), Stock level control, Naval operations, Maintenance.

This study extends the research results presented in an earlier study (AD-282 422) on demand prediction of naval aircraft technical repair items. The purpose of the study is to determine whether the demand characteristics for the F4D-1 jet fighter interceptor are subtantiated for other aircraft. The present aircraft types include a jet attack bomber, an ASW aircraft, a helicopter and a jet fighter interceptor. (Author)

AD-605 388 Div. 18
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PROGRAM BUDGETING IN THE DEPARTMENT OF DEFENSE,
by David Novick. Sep 64, 36p RM-4210-RC

Unclassified report

This memorandum represents one chapter in a forthcoming book, Program Budgeting: Program Analysis and the Federal Budget, sponsored by RAND Corp.

Descriptors: (*Department of Defense, Budgets), (*Defense systems, Costs), (*Management engineering, Department of Defense), Personnel, Decision making, Weapon systems, Military operations, Armed forces procurement, Ordnance, Armed forces budgets.

The significant feature of the new planning and programing process that was initiated within the Department of Defense in early 1961 is the approach that is taken to decision-making and control in the vital area of defense expenditures. Planning is considered in long-range terms of missions, forces, and weapon systems, i.e., resource outputs, rather than in terms of the standard appropriation categories of procurement, construction, personnel, etc. In the course of budget review, the need for hurried decisions, with their obvious drawbacks, on major programs has been reduced considerably. The annual budget is now only a part of a longer-range plan. The new process incorporates an up-to-date, Five-Year Force Structure and Financial Program, expressed in terms of forces, manpower, and dollar requirements. Since this program requires a continuous type of budget review, a Program Change Proposal System was developed to aid in achieving this requirement. In this system, approval thresholds are established to concentrate attention on the major current or prospective issues, this being an obvious application of management by exception.

AD-605 402 Div. 18, 22, 23
OTS Prices: HC $4.00/MF $1.00

Operations Research Center, Mass. Inst. of Tech., Cambridge.
ORDNANCE LOGISTICS STUDIES; IV: DISCUSSION NOTES FOR OPERATING SUPPLY PERSONNEL ON MATHEMATICAL METHODS OF SUPPLY CONTROL.
Interim technical rept. no. 19,
by Gottfried Oppenheimer. May 63, 136p
Contract DA31 124ORD14; Grant DA AROD31 124G158 AROD 968 35

Unclassified report

Rept. on Proj. Fundamental Investigations in Methods of Operations Research.

Descriptors: (*Logistics, Inventory control), (*Armed forces supplies, Mathematical analysis), (*Military personnel, Armed forces supplies), Mathematical analysis, Inventory analysis, Management engineering, Armed forces budgets, Ordnance, Costs, Armed forces procurement, Operation research.

constant interest in the thorough study and training in anti-atomic defense under various conditions of military operations. Training under conditions approximating actual battle conditions, which take into account a possible atomic attack will help to round out the reactions of Soviet airmen, will develop in them a high level of morale-fighting qualities. All this will contribute to the further growth of the fighting power of the Soviet Air Force.

AD-605 796 Div. 18
OTS Prices: HC $5.00/MF $1.00

American Machine and Foundry Co., Stamford, Conn.
LOGISTICAL OVER-THE-SHORE (LOTS) SYSTEMS STUDY.
Phase I rept.,
by P. Silverman, G. Bott, J. George, and H. Bossung.
Jun 64, 160p
Contract DA44 177AMC23T, Proj. 1D521801A266
TRECOM TR64 26 Unclassified report

Descriptors: (*Logistics, Armed forces transportation), (*Cargo ships, Logistics), Systems engineering, Military personnel, Armed forces supplies, Shipping (Marine), Amphibious operations, Naval vessels (Support), Landing craft, Yard craft, Effectiveness, Helicopters, Costs, Handling, Equations, Simulation, Computers.

The need to analytically define complex interphase relationships between the numerous elements of typical logistics-over-the-shore operations under varying operating conditions provides the basis for this study. Data related to LOTS are compiled, and decision rules for varying data in response to varying operating conditions are established. A rationale for computer simulation to test for potential improvements in LOTS productivity is developed. In addition, a method of measuring effectiveness of improvement candidates is derived.

AD-606 032 Div. 18
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE ROLE OF SCIENCE IN MODERN WARFARE,
by G. I. Pokrovskii. 21 Feb 58, 42p T-80
TT 64 71433
Unclassified report

Trans. of Voennaya Mysl' (USSR) 1955, Mar, p. 19-32.

Descriptors: (*Warfare, Scientific research), (*Nuclear weapons, USSR), (*Nuclear warfare, Scientific research), Detection, Rockets, Civil defense, Defense systems, Weapon systems, Communication systems, Ordnance, Logistics, Nuclear powered vessels, Submarines, Nuclear bombs, Aircraft, Armed forces (Foreign), Armed forces transportation, Economics, Military strategy.

Major General Pokrovskii's opinions on new developments in military affairs were made available February 5, 1958. The present article has a different kind of interest for us because it was published in March, 1955. Many of the developments that Pokrovskii then thought of as possibilities have since been brought to fruition. The possibility of employing atomic weapons secretly by masking their explosive action from detection devices is discussed. A description of rockets implies great sturdiness, since the component parts of the rockets are said to be readily mobile. Although these are described as 'long-range rockets' it is not clear from the text that rockets with the ranges of ICBM's rather than IRBM's are being described. The employment of deep mines for civil defense is described. Development of earth-moving machinery and excavating machinery is advocated. Speculation on the technical problems of under-ice navigation for atomic submarines is included.

was expected that such information, examined with the environments of those past campaigns firmly in mind, would suggest lessons for current and future air operations and when considered within the context of advanced technology, could provide guidance for future planning and hardware development.

AD-605 502 Div. 18
OTS Prices: HC $0.50/MF $0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
AIR-FILTER SHIELDING FOR EMERGENCY SHELTERS,
by N. Oldson, C. A. Dittus and W. R. Nehlsen.
19 Aug 64, 12p
Proj. Y F011 05 02 344
NCEL R326

Unclassified report

Descriptors: (*Shelters, Air intake filters), (*Air intake filters, Radioactive fallout), (*Radiation hazards, Shelters), Particle size, Shielding, Air pollution, Nuclear explosions.

Experiments were conducted to show which particle sizes of fallout falling from altitudes of 10,000 feet or more would be drawn into a typically protected shelter air intake. Results indicated that practically no particles over 60 microns in diameter would be captured. Some particles in the 30- to 60-micron-diameter size range were captured, and almost all particles below 30 microns in diameter were captured. Calculations made on two fallout-size distributions and three radioactivity levels indicate no significant hazard from material collected on the shelter air filters. Side-opening blast-closure devices, such as the AMF and OCD units, require additional protection to keep fallout from being capatured by the high velocities at the inlet. Shelters close to atomic blasts are likely to be subject to dangerous amounts of all sizes of particles coming from lower altitudes. These shelters must have all intakes closed during the danger period. (Author)

AD-605 505 Div. 18, 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE USES AND LIMITATIONS OF NUCLEAR DETERRENCE IN ASIA,
by Charles Wolf, Jr. Aug 64, 18p P-2958

Unclassified report

Descriptors: (*Nuclear warfare, Asia), (*Deterrence, Nuclear weapons), (*Foreign policy, Nuclear weapons), Communism, Military tactics, Armed forces (Foreign), Counterinsurgency, China, Political science, USSR.

The basic question of the threshold of stimulus, provocation, or violence, at which a U. S. nuclear response becomes sufficiently credible to be an effective deterrent is examined. Clearly, the threshold question conceals a number of complex issues, in Asia no less than in Europe. Would the use of nuclear weapons be militarily effective. (Are there tactical targets within the objective area that can be more effectively destroyed with nuclear weapons than with other means, without inflicting more significant damage on friend than foe. If not, then is geographic escalation with nuclear weapons against targets outside the tactical area likely to be more effective than conventional weapons in relieving the military threat. Is there a risk that use of nuclear weapons will involve the Soviet Union in further escalation moves., etc.) Are the political costs of using nuclear weapons likely to be too great in relation to military effectiveness to make their use credible. Can these political costs be reduced, or are they likely to be offset by the political costs of failing to make a stand. Implicitly, or explicitly, these questions are answered in sharply different ways by the two contrasting views of deterrence.

AD-605 673 Div. 18, 23
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ESTIMATING PERSONNEL AND EQUIPMENT REQUIREMENTS,
by W. W. Haythorn and E. W. Pickrel. 1 Jul 59, 36p
B-129

Unclassified report

Descriptors: (*Weapon systems, Management planning), (*Air force personnel, Military requirements), (*Logistics, Military requirements), Air force equipment, Mathematical prediction, Management control systems, Operations research, Maintenance, Malfunctions, Training.

AD-605 745 Div. 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME SOVIET VIEWS ON AIR STRATEGY (4 ARTICLES),
by I. V. Kravtsov, A. Kravchenko, A. Polyakov, and B. Aleksandrov. 3 Apr 58, 10p T-84
TT 64 71364

Unclassified report

Trans. of excerpts from Sovetskaya Aviatsiya (USSR) 1957, 15 Aug; 17 Aug; 11 Sep; Vestnik Vozdushnogo Flota (USSR) 1957, v. 39/40, no. 12, p. 80.

Descriptors: (*Military strategy, Aerial warfare), (*Aerial warfare, Military strategy), Strategic Air command, Air defense command, Nuclear warfare, Nuclear weapons, Drones, Propaganda, Defense systems, USSR, United States, Periodicals, Newspapers.

Partial translations of several Soviet articles on air strategy, particularly on the state of the art in the United States, are presented. The translated portion of the first article concerns itself with the Soviet view of U.S. - NATO strategic doctrine. The next three excerpts are from a Soviet air force newspaper. Two of them also deal with the American air strategy; the third discusses the impact of modern air technology on the conduct of war.

AD-605 767 Div. 18, 23
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ANTI-ATOMIC DEFENSE IN THE SOVIET AIR FORCE: EACH AIRMAN SHOULD HAVE BETTER KNOWLEDGE AND SKILL IN ANTI-ATOMIC DEFENSE.
5 Mar 58, 8p T-83
TT 64 71348

Unclassified report

Trans. from Sovetskaya Aviatsiya (USSR) 1957, 14 Dec.

Descriptors: (*Air force training, USSR), Air force personnel, Nuclear warfare, Radiation hazards, Defense systems, Communism, Armed forces (Foreign).

At the foundations of the training of Soviet soldier-airmen is a principle -- to teach that which is essential to know for fighting a war. To assume the successful realization of this principle under present conditions means to show

COMPENSATION OF A SAMPLE DATA CONTACTOR SERVO.
Master's thesis,
by Patrick B. Hutchings, Jr. May 59, 113p T-222
Contract AF04 647 303, Proj. 52 156
Unclassified report

Descriptors: (*Control systems, Navigation), (*Accelerometers, Feedback), Nonlinear systems, Navigation computers, Digital systems, Position finding, Reliability, Performance (Engineering), Transducers, Analog computers, Time, Acceleration, Servomechanisms.

The thesis is concerned with the analysis and compensation of a sample data contactor feedback control system. This accelerometer system, called a pulse restrained accelerometer (PRA), presents velocity information in increments of velocity. The thesis presents an analysis procedure for determining the behavior of the PRA system for zero input acceleration. The analysis is extended by heurisitic methods to predict the response of the system to steps and ramps of input acceleration. A simulation of the problem on an analogue computer provides a check on the analysis and indicates areas of further study. (Author)

AD-606 019 Div. 19, 12, 30
OTS Prices: HC $4.00/MF $1.00

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
LOW-THRUST VEHICLE GUIDANCE STUDY: VOLUME II, PARTS II AND III.
Final rept.,
by James S. Miller, John M. Dahlen, and Robert J. Magee.
Aug 61, 134p R-333, v. 2, pts. 2 and 3
Contract AF04 647 305
Unclassified report

Subcontract to Instrumentation Lab., Mass. Inst. of Tech., Cambridge.

Descriptors: (*Navigation computers, Space probes), (*Celestial guidance, Instrumentation), (*Space probes), Celestial guidance), (*Space navigation, Space probes), Lunar probes, Arc-jet engines, Thrust vector control systems, Tracking telescopes, Attitude control systems, Gyro stabilizers, Gimbals, Digital computers, Sextants, Infrared detectors, Numerical methods and procedures, Reliability, Operation, Feasibility studies.

This report considers various aspects of the guidance of a low-thrust vehicle. The report is divided into three parts: theory, guidance system implementation, and space sextant feasibility demonstration. The first part on theory presents a guidance scheme suitable for use on an arc-jet vehicle in an earth to lunar orbiting mission. Numerical results are presented which demonstrate the capability and performance of this scheme. The second part presents implementation schemes for a self-contained guidance and attitude control system for a lunar reconnaissance mission. The system uses a precise automatic space sextant supported by two mechanical degrees-of-freedom as a primary source of guidance and attitude control information. The third part reports on a laboratory experimental program to demonstrate the feasibility of the space sextant. Included are a physical description of the instrument and complete error analysis. (Author)

AD-606 020 Div. 19, 1, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
NONLINEARITIES IN THE STEADY-STATE OPERATION OF THE PENDULOUS INTEGRATING GYRO ACCELEROMETER,
by R. Zacharias. Apr 59, 12p STL-TN-590000-00255
Unclassified report

Descriptors: (*Accelerometers, Operation), (*Gyroscopes, Accelerometers), Servomechanisms, Nonlinear systems, Gimbals, Vector analysis.

The purpose is to present the development of equations of motion which describe the operation of the pendulous integrating gyro accelerometer. The degree of complexity which these equations may assume is limited primarily by one's diligence in detailing all the various effects known to influence accelerometer operation. In order to highlight the effect of servo stiffness, input motor axis misalignments, and gyro rotor misalignments on accelerometer linearity, other effects, although perhaps equally or more important, are neglected. (Author)

19. Navigation

AD-605 197 Div. 19, 8
OTS Prices: HC $2.00/MF $0.50

Navy Electronics Lab., San Diego, Calif.
OMEGA NAVIGATION CAPABILITY BASED ON PREVIOUS MONITORING AND PRESENT PREDICTION ABILITY,
by E. R. Swanson. 5 Jun 64, 32p
Task 6101
NEL 1226

Unclassified report

Descriptors: (*Radio navigation, Effectiveness), (*Hyperbolic navigation, Effectiveness), Very low frequency, Radio waves, Propagation, Phase shift, Diurnal variations, Phase measurement, Radio interference, Errors, Statistical analysis, Navigation.

Thirty-five individual days of recorded phase differences were selected at random and compared with predictions obtained from present diurnal theory using present phase velocities. The average resultant rms discrepancy was 10.4 cels (an abbreviation for centilanes, corresponding to 'per cent of cycle'). This implies a 24-hour navigation capability of about 1 nautical mile (c.e.p.) assuming geometry expected in a worldwide operational system, but using only present radiated power and prediction ability. (Author)

AD-605 409 Div. 19, 2, 12
OTS Prices: HC $7.00/MF $1.50

Federal Scientific Corp., New York.
STAR IDENTIFICATION BY OPTICAL RADIATION ANALYSIS.
Rept. for May 62-Jan 64.
Jan 64, 316p
Contract AF33 657 8184, Proj. 4200, Task 420006
AL TDR64 13

Unclassified report

Subcontract to Polarad Electronics Corp.

Descriptors: (*Stars, Identification), (*Celestial naviagation, Feasibility studies), (*Stellar map matching, Space naviagation), Optical properties, Measurement, Photometers, Filters (Electromagnetic wave), Star trackers, Celestial guidance, Navigation, Guidance, Aerospace craft, Astrophysics.

The purpose of this investigation is to determine the feasibility of recognizing stars by means of their optical radiation characteristics for use in the guidance and naviagation of aerospace vehicles. It is concluded that there are three easily measured independent parameters from the radiation of individual stars which permit unique recognition of the brightest stars above the earth's atmosphere. The report proceeds by analyzing and answering the following questions: (a) What parameters are intrinsic to a star (b) Which of these intrinsic parameters can be easily measured by radiation analysis (c) Using the accurate spectral data for bright stars which are reprinted in this report, can recognition be accomplished with the measurable parameters and (d) What is a practical means for accomplishing identification in a tactical situation. (Author)

AD-605 633 Div. 19
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
AIRCRAFT NAVIGATION BY SATELLITE,
by H. A. Myers. Sep 62, 32p P-2623 Unclassified report

Descriptors: (*Navigation satellites, Feasibility studies), (*Doppler navigation, Navigation satellites), Supersonic planes, Inertial navigation, Least squares methods, Errors.

Aircraft navigation using doppler and orbital information transmitted from a satellite is shown to be feasible, at least in a limited sense. The least squares, differential correction method of computation is used. If sufficiently accurate velocity information can be provided, this approach could yield positions for long-range aircraft that are an order of magnitude more accurate than have been achieved with other world-wide, all-weather, all-altitude systems, such as doppler and inertial navigators. The least squares, differential corrections solutions for both position and velocity do not converge for reasonable initial errors. Therefore, accurate aircraft velocity components, such as those provided by a doppler navigator, must be known. For one knot velocity errors the position of a 500-knot aircraft can be determined to one-half nautical mile or better for latitudes up to 70 degrees. (Author)

AD-605 819 Div. 19, 12, 25
OTS Prices: HC $5.00/MF $1.00

Radio Corp. of America, Camden, N. J.
FEASIBILITY OF TECHNIQUES FOR A DOPPLER OPTICAL NAVIGATOR.
Final rept. for Jun 63-Jun 64,
by W. J. Hannan, L. J. Nicastro, T. E. Penn, and J. Vollmer. Sep 64, 160p
Contract AF33 657 11458, Proj. 4427, Task 442703
AL TDR64 209

Unclassified report

See also AD-434 227.

Descriptors: (*Doppler navigation, Lasers), (*Navigational aids, Spaceborne), (*Lasers, Doppler navigation), Doppler effect, Guidance, Ground speed, Measurement, Satellites (Artificial), Electromagnetic waves, Optical equipment, Gallium compounds, Arsenides, Electron optics, Feasibility studies.

The objective of this program was to determine the feasibility of novel laser techniques for Doppler optical navigation. The ultimate performance goal is the measurement of ground speed of a satellite, traveling at a velocity of 10,000 meters per second at an altitude of 300 miles, with an accuracy of 5 meters per second. Either of two approaches can be used to instrument a Doppler optical navigator--the continuous-wave approach or the subcarrier approach. The results of the investigation of the subcarrier reveal that it offers a potential advantage over a microwave system for high-altitude applications, but at the present state of the art the laser transmitter power required at these altitudes cannot be realized. For low-altitude applications the subcarrier approach offers no great advantage over conventional microwave systems. However, for applications such as orbital rendezvous, where the range is relatively short and the radial rather than the tangential velocity is to be measured, the advantages of the subcarrier approach can be realized. For satellite velocities the extremely high Doppler frequencies which would be generated in the cw mode are prohibitively high for handling by state-of-the-art techniques, while for the low-altitude aircraft environment the cw approach is potentially capable of better performance than microwave systems. (Author)

AD-605 917 Div. 19
OTS Prices: HC $4.00/MF $0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.

the particular case of evaluating neutron fluxes in small volume detectors, a scoring by analytical estimation referred to as flux at a point is employed. (Author)

AD-605 492 Div. 20, 25
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
MATRIX ELEMENTS FOR POLARIZED FERMION SCATTERING.
Scientific rept. no. 1,
by Micha Hofri and Asher Peres. 2 Apr 64, 18p
Grant AF EOAR64 20
ARL 64 162

Unclassified report

Descriptors: (*Fermions, Nuclear scattering), (*Nuclear scattering, Fermions), Electrons, Nucleons, Nuclear spins, Polarization, Operators (Mathematics), Matrix algebra, Equations, Tables, Israel.

AD-605 619 Div. 20, 32
OTS Prices: HC $1.00/MF $0.50

Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST COORDINATE INDEX. PART II FOR ACCESSION LISTS FROM OCTOBER 1, 1963 TO AUGUST 31, 1964.
10 Sep 64, 20p

Unclassified report

A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Radiation effects, Indexes), (*Indexes, Radiation effects), (*Information retrieval, Radiation effects), Reports, Subject indexing, Articles, Abstracting, Radiation damage, Materials.

The Radiation Effects Information Center staff have determined that the Monthly Accession List is being used for retrospective searches as well as a current awareness facility. Consequently, the staff and the sponsor feel that an adequate index should be supplied to serve as a rapid search tool. The inverted concept-coordinate index is based upon terms generated in the REIC subject files. The index is cumulative throughout the year, and the staff will provide a dual dictionary at the end of each contract year to facilitate the retrospective search capabilities for the accession list abstracts. The index is subdivided into two sections. The first, Radiation Environment, includes dosimetry and energy aspects of all electromagnetic and particulate radiation sources, with the exception of space radiation. Section two deals with materials, properties, secondary environment (including space environments), devices, and all other subject concepts. An author section and a generating organization section will be added to the index quarterly. Under each concept term in the index are listed the accession numbers of the abstracts which have been indexed by that term. Links have been added where necessary to obviate improper coordination with the resulting false retrieval. Experience demonstrated that only four of the proposed EJC standard role indicators would have been required with any significant number of the entries.

AD-605 734 Div. 20, 18
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CONCERNING NEW APPLICATIONS OF THERMONUCLEAR REACTIONS,
27 Aug 64, 26p
FTD MT64 230; TT 64 71360

Unclassified report

Edited machine trans. of mono. Novoe v Voennoi Tekhnike (New Developments in Military Technology) Moscow, 1958, p. 5-19.

Descriptors: (*Thermonuclear reactions, Reviews), Solar energy, Stars, Nuclear reactions, Plasma medium, Magnetic pinch, Power reactors, Nuclear weapons, Radiological warfare agents, Bombers, USSR.

AD-606 005 Div. 20, 12, 13
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
STRUCTURAL IMPLICATIONS OF THE IONIZING RADIATION IN SPACE,
by Norris F. Dow. 30 Nov 59, 31p R60SD376
Contract AF04 647 269

Unclassified report

Paper prepared for presentation at the Symposium on Manned Space Stations, Los Angeles, Calif., 20-22 Apr 60, sponsored by IAS, NASA, and RAND.

Descriptors: (*Space environmental conditions, Shielding) (*Spacecraft, Shielding), Design, Structural parts, Van Allen radiation belt, Solar flares, Cosmic rays, Radiation damage, Metals, Plastics, Radiological dosage, Lead, Electrostatic fields, Electromagnetic fields, Composite materials, Thickness, Weight, Space stations.

A review is made of various aspects of the ionizing radiation in space and of their implications for the structural design of manned space vehicles. In all cases the radiation problems are considered from the standpoint of the structural design engineer in an effort to provide guidance toward possible approaches to the structural design problems. One of the most important problems is shown to be the protection of the human beings inside the vehicles from the energetic protons encountered either in the inner Van Allen radiation belt or sporadically from solar flares at any altitude above 100,000 feet within the solar system. An introduction is made to the design principles involved in both active (electrostatic and electromagnetic) and passive (composite materials) shielding. The conclusion is reached that the protection of the occupants from the hazards of ionizing radiation may require far more weight than any other structural requirement for manned space stations. (Author)

AD-606 028 Div. 20
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE COMPTON CURRENT AND THE ENERGY DEPOSITION RATE FROM GAMMA QUANTA-A MONTE CARLO CALCULATION,
by R. E. LeLevier. Jun 64, 49p RM-4151-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Nuclear explosions, Electromagnetic fields), (*Compton scattering, Monte Carlo method), (*Gamma rays, Compton scattering), Air burst, Electric currents, Energy, Quantum mechanics, Gamma-ray spectra.

The Compton current generated by the prompt gamma rays from an atmospheric nuclear explosion is known to be an important source for the electromagnetic signals

20. Nuclear Physics and Nuclear Chemistry

AD-605 127 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE PRINCIPLE OF INVARIANT IMBEDDING AND ONE-DIMENSIONAL NEUTRON MULTIPLICATION,
by Richard Bellman, Robert Kalaba, and G. Milton Wing.
19 Dec 56, 10p P-996
Unclassified report

Descriptors: (*Neutron reactions, Fission), (*Fission, Neutron reactions), Neutron flux, Invariance, Equations, Functions, Probability, Partial differential equations, Fast neutrons, Thermal neutrons.

A new method is introduced for treating problems involving neutron multiplication by fission, with special regard to questions of critical mass and distribution of neutrons. The results derive from applications of the principle of invariant imbedding, which was introduced and discussed in two previous papers (see AD-605 023, AD-605 114). (Author)

AD-605 165 Div. 20
OTS Prices: HC $0.50/MF $0.50

Naval Research Lab., Washington, D. C.
ANALYSIS OF ERRORS IN BUBBLE CHAMBER TRACK MEASUREMENTS.
Interim rept.,
by R. G. Glasser. 7 Aug 64, 22p
NRL 6150
Unclassified report

Descriptors: (*Particle trajectories, Measurement), (*Bubble chambers, Errors), (*Radiation measurement systems, Bubble chambers), Programming (Computers), Matrix algebra, Numerical analysis, Elementary particles.

The general procedures of propagation of errors were applied to derive error estimates for the quantities derived in the geometrical reconstruction of tracks and points in space from overdetermined stereoscopic measurements. Formulas are given which are suitable for use in computer programs such as PACKAG. The sources of error explicitly considered are measurement errors and multiple scattering errors. All computations use a Gaussian approximation to the distribution function. (Author)

AD-605 242 Div. 20, 2
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SPARK COUNTER FOR RECORDING PARTICLES OF COSMIC RADIATION,
by M. I. Pak and Yu. T. Lukin. 25 Aug 64, 14p
FTD MT64 45, TT 64 71294
Unclassified report

Edited machine trans. of Akademiya Nauk Kazakhskoi SSR, Alma Ata. Institut Yadernoi Fiziki. Trudy, 1963, v. 6, p. 105-111.

Descriptors: (*Cosmic rays, Radiation measurement systems), (*Radiation measurement systems, Sensitivity), Circuits, Effectiveness, Electrical properties, Voltage, Electric fields, Calorimeters, USSR.

A recommendation is made for selection of the magnitude of the spark counter feed voltage. It is shown that spark counter effectiveness depends not only on the electric field strength, but also on other design features of the counter when the other parameters are identical. A spark counter of area 23 X 34 sq. cm, and gap magnitude of 1.5 mm may be applied in work with an ionization calorimeter for research on particles of cosmic high-energy radiation. (Author)

AD-605 305 Div. 20
OTS Prices: HC $4.00/MF $0.75

Princeton Univ., N. J.
A MEASUREMENT OF PROTON-PROTON POLARIZATION AND TRIPLE SCATTERING PARAMETERS D, R, A, AND A' AT 430 MEV.
Technical rept. no. 33,
by Richard F. Roth. 30 Jul 64, 122p
Contract Nonr1858 06
Unclassified report

Descriptors: (*Proton beams, Polarization), (*Proton scattering, Measurement), Proton reactions, Nuclear spins, Particle accelerator targets, Radiation measurement systems.

The polarization parameters P, D, R, A, and A' were measured at 7 scattering angles between 30 degrees and 120 degrees in the center of mass with an incident energy of 430 MeV. A 56% polarized beam was prepared by scattering on an internal beryllium target in the Chicago Synchrocyclotron. A liquid hydrogen target was used for the p-p scattering and the outgoing polarization was analyzed with a third scattering in the carbon plates of a spark chamber. The scattering asymmetry was determined by fitting the data to a distribution by the maximum-likelihood method. The analysing power of the spark chamber as a function of energy was measured in beams of known polarization. The beam polarization before and after the p-p scattering was manipulated with a solenoid and two bending magnets. During a 5-weeks run, 1,400,000 pictures were taken. The pictures were scanned and measured on angular encoding machines with a least count of 1/3 degree. The measurements are compared with the extrapolations of several phase shift and resonance analyses of experimental data at higher and lower energies. (Author)

AD-605 458 Div. 20, 25, 30
OTS Prices: HC $6.00/MF $1.25

United Nuclear Corp., White Plains, N. Y.
UNC-SAM, A FORTRAN MONTE CARLO SYSTEM FOR THE EVALUATION OF NEUTRON OR GAMMA-RAY TRANSPORT IN THREE-DIMENSIONAL GEOMETRY,
by B. Eisenman and F. R. Nakache. 31 Aug 64,
213p UNC-5093
Contract DA30 0690RD3625, Proj. 2187
Unclassified report

Descriptors: (*Monte Carlo method, Neutron transport theory), (*Neutron transport theory, Monte Carlo method), (*Gamma rays, Transport properties), (*Programming (Computers), Monte Carlo methods), Programming languages, Neutrons, Geometry.

A code system (called UNC-SAM) which evaluates the transport of neutrons or gamma rays using Monte Carlo methods in complex three-dimensional geometry, has been written in FORTRAN for the Control Data Corporation 1604-A computer. The code will calculate fluxes, flux dependent functionals such as doses, and their stantard deviations in geometry comprised of rectangular parallelepipeds which, in turn, may contain spheres, cylinders, parallelepipeds, or wedges. In order to increase the efficiency of the Monte Carlo transport game, UNC-SAM uses an importance sampling technique. In addition, in

The tungsten and strontium concentration variations shed considerable light on stratospheric mixing processes. Ba-140, Sr-89, and Ce-144 concentrations assist in determining the age of debris and thus allow following of stratospheric mixing and transfer processes. A number of definite seasonal effects are noted.

21. Nuclear Propulsion

AD-605 574 Div. 21, 20, 27
OTS Prices: HC $6.00/MF $1.25

Space Technology Labs., Inc., Los Angeles, Calif.
A PRELIMINARY PARAMETRIC SURVEY OF URANIUM-CARBON NUCLEAR REACTOR ROCKET SYSTEMS,
by Earl W. Allen. 29 Jun 60, 206p
STL GM-60-7630.2-11

Unclassified report

Descriptors: (*Nuclear reactors, Rocket propulsion), (*Rocket propulsion, Nuclear reactors), (*Space propulsion, Nuclear reactors), Uranium, Carbon, Nuclear engineering, Heat transfer, Reactor lattice parameters, Reactor operation, Nuclear propulsion, Nuclear physics, Hydrogen, Reactor coolants, Feasibility studies.

This report presents some of the data obtained during a parametric study of single-pass, bare, uranium-carbon reactors using hydrogen as a coolant fluid. The reactor compositions, dimensions, and weights are related to outlet temperatures and ideal thrusts. It is necessary to point out that many of the assumptions are quite crude, and that these data are to be used primarily to gain some insight into the problems and to provide guidance in the preparation of more detailed studies. Certain performance restraints, possible alternate approaches to studies of this type, and the usefulness of such studies are discussed. (Author)

AD-606 016 Div. 21, 27
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ADIABATIC COMPRESSOR PROPULSION SYSTEM,
by R. B. Reddy and K. D. Favro. 13 Jul 60,
45p STL-CM-60-7630.2-10

Unclassified report

Descriptors: (*Nuclear propulsion, Compressors), (*Compressors, Rocket motors), Performance (Engineering), Design, Hydrogen, Fuels.

A method to improve the performance of solid-core nuclear rocket engines is examined. The device proposed employs an adiabatic compressor to raise the fuel specific impulse of hydrogen which has already been directly heated by a nuclear reactor. A preliminary design of the compressor is presented, and the over-all system described. A mission analysis is discussed. It appears that this device has a performance capability for certain missions intermediate between the direct heating nuclear rocket and the electrical propulsion schemes. (Author)

which accompany such explosions. The space-time dependence of the Compton current and the energy deposition rate are calculated using the methods of the Monte Carlo technique. Included are the effects of the energy spectrum of the gamma quanta and the time-spreading due to the multiple scattering of the quanta. The purpose is to provide accurate estimates for the current and the energy deposition rate, thereby eliminating one source of uncertainty in the theoretical estimates of the electromagnetic fields generated by this mechanism. (Author)

AD-606 029 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RED STAR SERIES ON ATOMIC ENERGY. PT. I. STRUCTURE AND PROPERTIES OF THE NUCLEUS,
by V. Mikhailov. 10p T-35 pt. 1
TT 64 71430

Unclassified report

Trans. from Krasnaya Zvezda (USSR) 1954, 14 Jan, p. 3.

Descriptors: (*Nuclear physics, USSR), (*Nuclei, Nuclear structure), (*Nuclear physics, Nuclei), Atomic structure, Electrons, Protons, Neutrons, Isotopes, Nuclear reactions, Atomic properties, Nuclear energy.

AD-606 030 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RED STAR SERIES ON ATOMIC ENERGY. PT. II. RADIOACTIVE DISINTEGRATION OF NUCLEI,
by V. Mikhailov. 10p T-35 pt. 2
TT 64 71431

Unclassified report

Trans. from Krasnaya Svezda (USSR) 1954, 26 Feb., see also AD-606 029.

Descriptors: (*Nuclear reactions, Radioactivity), (*Radioactivity, Nuclear reactions), (*Nuclei, Nuclear physics), Radioactive isotopes, Artificial radioactivity, Half life, Radioactive decay, Alpha decay, Beta decay, Gamma rays, Radiation effects, USSR.

A discussion is presented on the discovery of radioactivity and its subsequent application to physics, chemistry, medicine, and technology. The effects of radiation on the human organism are also considered.

AD-606 056 Div. 20, 13, 33
OTS Prices: HC $6.00/MF $1.25

Air Force Weapons Lab., Kirtland AFB, N. Mex.
AIR TRANSPORTABILITY OF REACTOR AND RADIOISOTOPE MATERIALS,
by James Fox. Aug 64, 258p
Proj. 2800, Task 280004
WL TDR64 81

Unclassified report

Descriptors: (*Radioactive isotopes, Air transportation), (*Reactor materials, Air transportation), (*Nuclear reactors, Air transportation), (*Air transportation, Reactor materials), Nuclear power plants, Logistics, Economics, Reactor system components, Packaging, Handling, Radioactivity, Hazards, Safety, Feasibility studies.

A study was made to investigate the prime considerations involved in air transportation of nuclear reactor components, radioactive wastes, and radioisotope power-generating units. The logistics, economics, and safety of supplying a remote military nuclear power plant by air and of transporting SNAP-type reactor and radioisotope auxiliary power units by USAF aircraft are explored in detail. It was determined that such air transport operations are feasible and reasonably safe if proper planning is accomplished in the design of equipment and in the definition of mission profiles and ground handling procedures. Container criteria and procedural standards for the transport of the different categories of materiel are recommended. (Author)

AD-606 073 Div. 20
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NEW SEARCHES FOR HEAVY ISOTOPES OF HYDROGEN,
by N. A. Vlasov. 17 Apr 64, 9p
FTD MT63 343; TT 64 71440

Unclassified report

Edited machine trans. of Atomnaya Energiya (USSR) 1963, v. 14, no. 6, p. 593-594.

Descriptors: (*Hydrogen, Isotopes), (*Isotopes, Hydrogen), Nuclear reactions, Neutrons, Radioavtive decay, Reviews, USSR.

A review of recent attempts to obtain the isotopes H4 and H5.

AD-606 132 Div. 20, 2
OTS Prices: HC $6.00/MF $1.50

Defense Atomic Support Agency, Washington, D. C.
HIGH ALTITUDE SAMPLING PROGRAM (HASP).
Special rept. no. 2,
by Albert K. Stebbins, III. 1 Aug 61, 294p
DASA 539B; PB 181 066

Unclassified report

We regret that legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Stratosphere, Radioactive fallout), (*Nuclear explosions, Air pollution), (*Radioactive fallout, Sampling), Atmosphere, Radioactive isotopes, Tropical regions, Polar regions, Radiological dosage, United States, Strontium, Aerosols, Tungsten, Barium, Cerium, Rhodium, Plutonium, Carbon, Beryllium, Phosphorus, Lead, High altitude, Flight, Distribution.

A recalibration of the U-2 ducts has diminished the previous discrepancy noted in the flow rates. Absolute values of radionuclide concentrations are increased 8 to 13% by this recalibration. A discussion on the structure and nature of the 0.1 to 1.0 micron family of naturally occuring stratospheric aerosol is presented. This dust layer of ammonium sulfate appears to be generated in the stratosphere and may play an important role in lower stratospheric fallout processes. A detailed discussion of stratospheric concentrations of a number of nuclides is presented. Sr-90 and W-185 inventories and distributions from August 1957 to May 1960 are discussed. By May 1960 maximum tungsten values are found in the lower altitude equatorial regions while maximum strontium values are found in the higher altitude polar regions. The tungsten stems from low altitude HARDTACK shots only while the strontium appears to show influx from Teak and Orange.

Formulas are given for the determination of the propagated errors in triangulations by length and angle measuring methods. The results are presented in diagrams. The two-dimensional problem is treated only. Conclusions are drawn concerning the most economical and most accurate triangulation method for full scale trajectory measurements. (Author)

AD-605 704 Div. 22, 24
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
LUMINESCENCE OF A FRONT OF LOW DETONATION SPEED IN NITRO-GLYCERINE,
by G. S. Sosnov, I. M. Voskoboinikov, and A. V. Dobovik.
17 Apr 64, 10p
FTD MT64 01; TT 64 71355

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR, Doklady, 1963, v. 149, no. 3, p. 624-643.

Descriptors: (*Nitroglycerin, Detonations), (*Detonations, Nitroglycerin), Detonation waves, Luminescence, Photographic analysis, Photographic equipment, Acrylic resins, Steel, Waxes, Lead, Materials, USSR, High-speed photography.

This report is a study of the low detonation speed in nitroglycerine with high speed photography. Low speed conditions were carried out in cylindrical charges of nitroglycerine with the help of an intermediate charge of sodatol through a thin plexiglas plate. The detonation front is disturbed in materials where the speed of sound is less than 2.0 km/sec. The detonation front is stable in materials where the speed of sound is greater than 2.0 km/sec. The mechanism of propagation in the stable wave was found to be a concave wave profile relative to the direction of propagation.

AD-605 706 Div. 22
OTS Prices: HC $11.70/MF $3.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THEORY OF EXPLOSIVES: COLLECTION OF ARTICLES,
by K. K. Andreev, A. F. Belyaev, A. I. Gol'binder, and A. G. Gorst. 31 Jan 64, 868p
FTD MT63 254; TT 64 71357

Unclassified report

Edited machine trans. of mono. Teoriya Vzryvchatykh Veshchestv: Sbornik Statei, Moscow, 1963, 579p.

Descriptors: (*Explosive materials, Theory), Detonation, Sensitivity, Deformation, Impact shock, Impurities, Combustion, Ignition, Oxidizers, Thermochemistry, Shock waves, Nitroglycerin, PETN, Nitrobenzenes, Ammonium compounds, Glycols, Nitrates, Potassium compounds, Lead compounds, USSR.

The collection consists of four divisions. The first division covers the questions of sensitivity of explosives to mechanical influences, considered on the basis of new presentations about the appearance of an explosion during shock. Articles in the second division are devoted to the results of the investigation of the thermal disintegration of different nitro esters and certain nitrocompounds. In the third division there is research on the ignition and detonation of explosives. In the fourth division are articles refering to different questions of the theory of explosives. (Author)

AD-605 836 Div. 22
OTS Prices: HC $2.00/MF $0.50

MB Associates, San Ramon, Calif.
DEVELOPMENT OF A SABOTING TECHNIQUE FOR LIGHT GAS HYPERVELOCITY PROJECTORS,
Feb 63, 36p MB-R-63/14
Contract Nonr2618 00X, ARPA Order 70
N63 22123

Unclassified report

Descriptors: (*Hypervelocity projectiles, Launching), (*Sabot projectiles, Separation), Light gas guns, Aerodynamic characteristics, Propellants, Combustion, Velocity, Design, Aluminum, Glass textiles.

A sabot, utilizing internal gas expansion to separate its halves, was developed for use in the launching of hypervelocity projectiles. Most sabots are designed so that aerodynamic forces will strip the parts away from the projectile. Here, separation was achieved by burning a propellant inside the sabot while it traveled down the gun barrel. Upon launch, the high pressure gases imparted lateral velocity to the halves by expansion work. It was desired to achieve separation velocities of 1.5 x 10,000 cm/sec. At this velocity each half of the sabot would be displaced 10 cm from the trajectory at 6 meters from launch when fired at a velocity of 29,500 feet per second. A total of 33 experimental firings were carried out from CAL .60 powder and light gas guns. Both aluminum and fiberglas sabots were used. The lighter fiberglas sabot gave the desired separation velocity when fired at 8570 feet/second from the powder gun. However, it fractured when fired from the light gas gun. The aluminum sabot gave a lateral velocity of 0.8 x 10,000 cm/sec when fired at 14,000 feet/second from the light gas gun. Two major problems were high projectile dispersion and sabot mass. (Author)

AD-606 052 Div. 22, 4, 25
OTS Prices: HC $3.00/MF $0.50

California Univ., Berkeley.
GASDYNAMIC EFFECTS OF SHOCK-FLAME INTERACTIONS IN AN EXPLOSIVE GAS,
by A. J. Laderman, P. A. Urtiew, and A. K. Oppenheim.
1964, 52p
Grants AF AFOSR129 64, NsG10 59
AFOSR 64 1676

Unclassified report

Descriptors: (*Explosive gases, Dynamics), (*Shock waves, Flame propagation), (*Flame propagation, Shock waves), Experimental data, Photographic analysis, Transducers, Pressure, Velocity, Detonation, Schlieren photography, Explosive materials, Gases, Hydrogen, Oxygen, Mixtures.

Previous studies of the shock-flame interaction processes are critically reviewed. Experimental observations reported in the literature are analyzed by means of the Vector Polar Method which provides information on the stationary states produced by the interactions rather than on the processes that occur in the course of their progress. Results of our experimental study performed with the use of hydrogen-oxygen mixtures at low initial pressures are then presented and interpreted by the use of the same method of analysis. The study leads to the following conclusions: (1) a satisfactory explanation of the interaction effects can be obtained on the basis of gasdynamic analysis, provided that proper allowance is made for the finite change in the relative flame propagation speed; (2) the most important result of the interaction process is the change in the flame-front structure; and (3) the amplification of the propagation velocity of the flame is associated with the breakup of its front into a space distributed reaction zone. (Author)

22. Ordnance

AD-605 201 Div. 22, 9
OTS Prices: HC $4.00/MF $0.75

Technical Military Planning Operation, General Electric Co., Santa Barbara, Calif.
AXIAL-SYMMETRIC BLAST WAVES IN FLUID DYNAMICS AND MOTION OF PARTICLES.
Research rept.,
by Guenter M. Schindler. 15 Apr 64, 118p
RM64TMP-17
Contract DA49 146XZ190
DASA 1507

Unclassified report

Descriptors: (*Shock waves, Fluid dynamic properties), (*Nuclear explosions, Shock waves), Nuclear particles, Explosion effects, Axially symmetric flow, Boundary value problems, Equations.

The report deals with the solution of axial-symmetric shock waves in fluid dynamics generated by a point source explosion and with the determination of the particle paths. The entire blast wave problem is formulated as a classical initial-boundary value problem; some approaches to its numerical solution are elaborated. Special attention is paid to the uniqueness of the solutions and to the possibility of determining geometric configuration and expansion rate of the shock wave without integrating the fluid dynamics equations. The effectiveness of the method developed is demonstrated in an application to a particular situation. (Author)

AD-605 217 Div. 22, 17, 30
OTS Prices: HC $2.00/MF $0.50

Springfield Armory, Mass.
APPLICATION OF LAMB WAVES TO THE EXAMINATION OF STEEL STRIP FOR LAMINAR DEFECTS,
by H. P. Hatch and K. A. Fowler. 12 Aug 64, 30p
SA TR19 1510

Unclassified report

Descriptors: (*Steel, Metallography), (*Non-destructive testing, Ultrasonic radiation), (*Gun components, Materials), Test methods, Test equipment, Microstructure.

A nondestructive method of detecting laminar defects in steel strip was developed. Lamb waves, generated in the strip by a wheel type search unit, were utilized to provide 100 per cent scanning of the 2.25-inch wide coiled strip. The test fixture and the auxiliary equipment, required for the test method, are described. Typical test indications are shown and are discussed in terms of defect severity as determined by metallographic examination. (Author)

AD-605 394 Div. 22, 26
OTS Prices: HC $2.00/MF $0.50

Aeroprojects, Inc., West Chester, Pa.
SEALING OF PROPELLANT CONTAINERS BY ULTRASONIC WELDING.
Jun 64, 34p AEROPROJ-RR-64-41
Contract DA36 034AMC0061A

Unclassified report

Descriptors: (*Containers, Ammunition propellants), (*Welding, Containers), (*Ultrasonic radiation, Welding), Aluminum alloys, Rings, Hermetic seals, Welds, Tests, Machines, Ammunition components.

Ultrasonic ring welding was used to make elliptical weld closures for propellant containers having an elliptical cross section, with a relationship of less than 2 to 1 between the major and minor axis dimensions of the ellipse. The original container design was modified to include an 0.015-inch-wide flange at its open end. Component materials selected were 0.010-inch Type 3003-0 aluminum alloy for the container, and 0.005-inch Type 3003-H19 aluminum alloy for the flat cover. The components were ultrasonically cleaned before being welded on a 4-kilowatt 15-kc torsional welder. Equipment modifications included a special welding tip and a welding anvil with a positioning recess for the weldment. Initial feasibility experiments having been successful, Picatinny Arsenal was provided with sample welded assemblies for further evaluation, these samples having been welded at machine settings of 2200 watts electrical power input to the ultrasonic transducer, 450 pounds clamping force, and 0.12-second weld pulse interval. Prior to welding, half of the samples had been filled with calcium chloride, and half with Hercules Pistol Powder. Metallurgical evaluation indicated sound bonds, and hermetic sealing was verified by helium-leak and water-submersion tests. (Author)

AD-605 427 Div. 22
OTS Prices: HC $2.00/MF $0.50

Air Proving Ground Center, Elgin AFB, Fla.
ENGINEERING EVALUATION OF M117 BOMB WITH BLUNT NOSE,
by George R. Offen. Aug 64, 27p
Proj. 0157W
APGC TDR64 51

Unclassified report

Descriptors: (*Bombs, Performance (Engineering)), (*Blunt bodies, Bombs), Design, Penetration, Instrumentation, Flight testing, Jet fighters, Bomb components, Release mechanisms, Air force research, Bombing, Bomb trajectories, Experimental data.

Two attachments to the nose of an M117 bomb were tested in an attempt to determine if these devices would improve the bomb's richochet and penetration characteristics. One of these attachments was a blunt nose shape; the other was a more complex shape that had been adapted from a model which an allied Air Force claimed to work successfully on their 400-kilogram bomb. Neither of these designs changed the richochet characteristics of the M117 enough to warrant its adoption. However, several ideas are suggested for improved or different attachments to the M117 bomb, and it is recommended that these concepts be pursued further. A series of tests was also conducted under this project to study the richochet and penetration characteristics of the standard M117 and the BLU-14/B bombs. These tests were conducted to provide data for a comparison with the modified M117 bombs mentioned above. The results of these tests are presented in this report and substantiate the results that had been obtained during an earlier limited evaluation of the M117 bomb and the MLU-10/B mine. (Author)

AD-605 695 Div. 22, 15
OTS Prices: HC $2.00/MF $0.50

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE PROPAGATION OF ERRORS OF TRIANGULATION FOR LENGTH AND ANGLE MEASURING METHODS,
by Hellmut Schmid. Oct 52, 28p
Proj. TB3 0838
BRL MR625

Unclassified report

Descriptors: (*Projectile trajectories, Measurement), Errors, Propagation, Trigonometry, Vector analysis.

of radio, mathematics, and electronics information items from several of the tests. These measures will be included in comprehensive studies of experimental and operational predictors as part of the total classification battery and aptitude area system. (Author)

AD-605 335 Div. 23, 18, 30
OTS Prices: HC $1.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XXIII. INSTRUCTOR'S MANUAL.
Self-instructional course.
Jun 64, 11p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V23

Unclassified report

See also AD-605 353

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 336 Div. 23, 18, 30
OTS Prices: HC $3.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XI. WRITING QUERY LANGUAGE STATEMENTS.
Self-instructional course.
Jun 64, 73p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V11

Unclassified report

See also AD-605 339.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 337 Div. 23, 18, 30
OTS Prices: HC $4.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XII. SIMPLE SUMS WITH THE AIR UNIT TABLES.
Self-instructional course.
Jun 64, 104p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V12

Unclassified report

See also AD-605 336.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 338 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME VII. THE OPERATION AND CAPABILITY OF THE COMPUTER RETRIEVAL PROGRAMS.
Self-instructional course.
Jun 64, 36p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V7

Unclassified report

See also AD-605 354.

Descriptors: (*Training devices, Instructions manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 339 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME X. WRITING QUERY LANGUAGE STATEMENTS.
Self-instructional course.
Jun 64, 48p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V10

Unclassified report

See also AD-605 342.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 340 Div. 23, 18, 30
OTS Prices: HC $3.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME IV. THE OPERATION AND CAPABILITY OF THE COMPUTER RETRIEVAL PROGRAMS.
Self-instructional course.
Jun 64, 97p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V4

Unclassified report

See also AD-685 355.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Teaching machines, Instruction manuals), (*Information retrieval, Air force operations), Education, Programming (Computers), Languages.

AD-605 341 Div. 23, 18, 30
OTS Prices: HC $3.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME VIII. WRITING QUERY LANGUAGE STATEMENTS.
Self-instructional course.
Jun 64, 56p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V8

Unclassified report

See also AD-605 338.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices),

23. Personnel and Training

AD-605 236 Div. 23, 16, 28
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
WHO MAY BECOME AN ASTRONAUT,
by M. A. Novikov. 23 Jul 64, 12p
FTD TT64 260; TT 64 71288

Unclassified report

Unedited rough draft trans. of Zdorov'e (USSR) 1963, v. 9, no. 4, p. 4-7.

Descriptors: (*Astronauts, Selection), (*Space medicine, Psychophysiology), Physical fitness, Training, Group dynamics, Centrifuges, Acceleration tolerence, Confinement (Psychology), Stress (Psychology), USSR

A popularized account concerning the psychophysiological factors involved in the selection and preparation of astronauts.

AD-605 280 Div. 23, 28
OTS Prices: HC $1.00/MF $0.50

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
COMBAT PERFORMANCE OF EM WITH DISCIPLINARY RECORDS,
by A. U. Dubuisson and W. A. Klieger. Jun 64, 20p
Proj. 2J024701A722
APRO TRN148

Unclassified report

Report on Retention Standards b-12 Proj.

Descriptors: (*Army personnel, Behavior), (*Military law, Army personnel), Military requirements, Selection, Performance (Human), Military psychology, Army training, Warfare, Correlation techniques.

The present study was undertaken to clarify the relationship between disciplinary behavior and combat performance and to assure that operational utilization of a set of valid measures designed to eliminate the potential troublemaker would not also serve to eliminate a needed type of combat soldier in times of open conflict. Combat ratings obtained on enlisted men serving in the Korean War were analyzed to compare the fighting effectiveness of men with precombat court-martial conviction and men with 'clear' records. In an enlistee (RA) sample (incidence of court-martial conviction in the inductee (US) sample was too small for analysis) men with precombat court-martial convictions were on the average poorer combat soldiers than were men with no such convictions. The RA component had a larger percentage of other-than-honorable discharges than did the US component (17% vs 2%; and, among those receiving honorable discharges, a larger percentage of the RA men had records of court-martial conviction (20% vs 3%). (Author)

AD-605 281 Div. 23, 28
OTS Prices: HC $2.00/MF $0.50

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
RESEARCH TO IMPROVE ENLISTED CLASSIFICATION TECHNIQUES,
by William H. Helme. Jun 64, 32p
Proj. 2J024701A722
APRO TRR1137

Unclassified report

Report on New Classification Techniques.

Descriptors: (*Army personnel, Selection), (*Aptitude tests, Army personnel), Test construction (Psychology), Anthropometry, Psychometrics, Physical fitness, Personnel management, Electronic technicians, Maintenance personnel, Personality, Intelligence tests, Performance (Human), Correlation techniques, Military requirements, Military training.

Research responsive to the Army requirement for maintenance and continued development of the aptitude area system of differential classification of enlisted men is reviewed. Research effort of the NEW CLASSIFICATION TECHNIQUES Task has been devoted substantially to improved measures for the Army Classification Battery (ACB) and identification of combinations of tests which are the most effective differential predictors of success in occupational areas and subareas. Additional Task objectives encompass (1) identifying potential career enlisted men; (2) screening and assignment of enlisted men of relatively low ability, (3) developing physical proficiency measures to classify EM for combat and combat-support MOS with unusual physical demands. New Classification tests developed and ready for comprehensive evaluation as potential components of the ACB include: aptitude and ability tests for Electronics, General Maintenance, Motor Maintenance, and Clerical job areas; three information tests for Construction and Mechanical-Electrical jobs; and personality-interest measures. (Author)

AD-605 282 Div. 23, 28
OTS Prices: HC $2.00/MF $0.50

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
VALIDATION OF EXPERIMENTAL ELECTRONICS SELECTION BATTERY,
by Robert S. Andrews and Seymour Ringel.
Jun 64, 50p
Proj. 2J024701A723
APRO TRR1138

Unclassified report

Report on Command Systems C-00 Project.

Descriptors: (*Electronic technicians, Selection), (*Aptitude tests, Army personnel), (*Army personnel, Electronic technicians), Personnel management, Test construction (Psychology), Reasoning, Reading, Personality, Psychometrics, Intelligence tests, Military requirements, Military training, Correlation techniques, Performance (Human).

Accelerated use of electronic systems and equipment in the Army has generated an increasing requirement for means of selecting personnel who can successfully complete electronics training courses and satisfactorily perform in highly critical electronics positions. The present publication summarizes research accomplished in several integrated studies which culminated in development of an experimental electronics selection battery of 15 tests. The component experimental measures--three information, five reasoning ability, six noncognitive ability, one personality background--were evaluated in conjunction with the operational Army Classification Battery (ACB) for effectiveness in differentiating between potential for electronics (high complexity) MOS and electrical (low complexity) MOS. Three measures, two which were derived from a single instrument--the Personal Inventory for Electronics--emerged as the most promising predictors of success in Electronics MOS. The third measure, RME, was composed

Self-instructional course.
Jun 64, 36p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V5

Unclassified report

See also AD-605 340.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force opreration), Teaching machines, Education, Languages, Programming (Computers).

AD-605 349 Div. 23, 18, 30
OTS Prices: HC $4.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XV. SORTING AND SPECIFYING TITLES.
Self-instructional course.
Jun 64, 110p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V25

Unclassified report

See also AD-605 356.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 350 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XVII. EXHIBITS.
Self-instructional course.
Jun 64, 30p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V17

Unclassified report

See also AD-605 346.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 351 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XVIII. EXERCISE WORKBOOK.
Self-instructional course.
Jun 64, 36p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V18

Unclassified report

See also AD-605 350.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 352 Div. 23, 18, 30
OTS Prices: HC $1.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XIX. PROFICIENCY TESTS.
Self-instructional course.
Jun 64, 16p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V19

Unclassified report

See also AD-605 351.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 353 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XXII. REFERENCE MANUAL.
Self-instructional course.
Jun 64, 32p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V22

Unclassified report

See also AD-605 345.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 354 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME VI. THE OPERATION AND CAPABILITY OF THE COMPUTER RETRIEVAL PROGRAMS.
Self-instructional course.
Jun 64, 36p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V6

Unclassified report

See also AD-605 348.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 355 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME III. THE OPERATION AND CAPABILITY OF THE COMPUTER RETRIEVAL PROGRAMS.
Self-instructional course.
Jun 64, 38p

(*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 342 Div. 23, 18, 30
OTS Prices: HC $3.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME IX. WRITING QUERY LANGUAGE STATEMENTS.
Self-instructional course.
Jun 64, 79p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V9

Unclassified report

See also AD-605 341.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 343 Div. 23, 18, 30
OTS Prices: HC $1.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XX. TEST ANSWER KEY.
Self-instructional course.
Jun 64, 10p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V20

Unclassified report

See also AD-605 352.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 344 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME I. PREPROGRAM-HOW TO USE THE QUERY LANGUAGE SELF-INSTRUCTIONAL COURSE.
Self-instructional course.
Jun 64, 34p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V1

Unclassified report

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Teaching machines, Instruction manuals), (*Information retrieval, Air force operations), Education, Programming (Computers), Textbooks, Languages.

This self-instructional course teaches the Query Language of System 473L for the Operational Test Capability phase (OTC). The course consists of twenty-three volmes. It includes: Volume I: Preprogram - Instructions on How to Use the Query Language Self-Instructional Course; Volmes II - XVI: Programed Instruction on the OTC Query Language; Volume XVIII: Exercise Workbook; Volume XIX: Proficiency Tests; Volume XX: Test Answer Key; Volume XXI: Time Record; Volume XXII: Reference Manual; Volume XXIII: Instructor's Manual. The programmed-instruction format of this course permits the student to learn at his own pace without the aid of an instructor. (Author)

AD-605 345 Div. 23, 18, 30
OTS Prices: HC $1.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XXI. TIME RECORD.
Self-instructional course.
Jun 64, 7p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V21

Unclassified report

See also AD-605 343.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 346 Div. 23, 18, 30
OTS Prices: HC $3.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XVI. ADDITIONAL PROCESS DIRECTORS AND A REVIEW OF RULES.
Self-instructional course.
Jun 64, 83p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V16

Unclassified report

See also AD-605 349.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 347 Div. 23, 18, 30
OTS Prices: HC $4.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME II. AN INTRODUCTION TO THE 473L SYSTEM.
Self-instructional course.
Jun 64, 113p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V2

Unclassified report

See also AD-605 344.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Teaching machines, Instruction manuals), (*Information retrieval, Air force operations), Programming (Computers), Decision making, Education, Languages.

AD-605 348 Div. 23, 18, 30
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME V. THE OPERATION AND CAPABILITY OF THE COMPUTER RETRIEVAL PROGRAMS.

AD-606 004 Div. 23, 28
OTS Prices: HC $2.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
A SUGGESTED GUIDE TO POSITION STRUCTURE,
by Robert B. Miller. May 56, 50p
Contract AF18 600 1203, Proj. 7709, Task 77150
AFPTRC TM56 13

Unclassified report

Descriptors: (*Job analysis, Air force personnel), (*Air force personnel, Job analysis), Air force training, Performance (Human), Personnel management, Training devices, Decision making, Monitors, Scanning, Job analysis, Maintenance, Time studies, Test methods, Human engineering, Manpower studies.

A position is defined as the total set of tasks which might reasonably be perfomed, on the average, by a single individual during a period of maximum effort such as may occur in simulated or actual combat missions. Position structure is the assigning of all tasks and groups of tasks within an organizational unit to individual positions on the basis of (a) requirements of the organizational unit to accomplish a goal, and (b) the psychological factors going into individual training and performance. The product of this structuring is a position organization table which will provide the data the Air Force may use in establishing official tables of organizations and manning tables. The development of position structures must reconcile solutions to two divergent problems. One of these problems is finding the most efficient and least vulnerable pattern of manpower capability from the standpoint of unit operation. This is an operational problem. The second problem is the related question of the best allocation of duties and tasks to an individual in terms of selection and training economy. This is the psychological problem. A sound table of organization and manning table will be an optimum solution to both the operational and psychological problems.

AD-606 010 Div. 23, 28
OTS Prices: HC $4.00/MF $1.00

American Inst. for Research, Pittsburgh, Pa.
A SUGGESTED GUIDE TO POSITION-TASK DESCRIPTION,
by Robert B. Miller. Apr 56, 110p
Contract AF18 600 1203, Proj. 7709, Task 77150
ASPRL TM56 6

Unclassified report

Descriptors: (*Job analysis, Weapon systems), (*Air force personnel, Job analysis), (*Weapon systems, Job analysis), Air force training, Training devices, Human engineering, Maintenance, Test methods, Performance (Human), Monitors, Military requirements, Personnel management, Time studies, Decision making, Control systems, Systems engineering, Manpower studies.

The primary purpose of this guide is to expound methods which may be used for describing job requirements for operation and maintenance of new Air Force weapon systems. The procedures and format suggested in this guide for preparing position-task descriptions are not the only ones which may serve adequately for anticipating the personnel and training requirements generated by new Air Force weapon systems. The procedures described are based, however, upon previous studies in which job information was developed and recorded for the operation and maintenance of certain complex systems. These procedures, therefore, have been tested on a trial basis through application to selected equipment systems. Position-task description represents a means of systematically developing information which is required at one time or another in the multitude of personnel and training actions which must be planned and accomplished before a new weapon system is introduced into the field. It is recognized that for specific purposes less detailed job information may be required than is described in this guide. It is expected that this guide will be helpful in indicating even for these more restricted purposes how the required information might be assembled and recorded.

AD-606 011 Div. 23, 18
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
PERSONNEL SUBSYSTEM DEVELOPMENT AND TEST PROGRAM,
by Wilton P. Chase. 15 Jul 61, 82p
STL-6101-0004-MU-000
Contract AF04 694 1

Unclassified report

A portion of the original document contains fine detail which may make reading of photocopy difficult.

Descriptors: (*Military personnel, Military organizations), (*Military organizations, Human engineering), Job analysis, Weapon systems, Armed forces operations, Performance (Human).

Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V3

Unclassified report

See also AD-605 347.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Teaching machines, Instruction manuals), (*Information retrieval, Air force operations), Education, Programming (Computers), Languages.

AD-605 356 Div. 23, 18, 30
OTS Prices: HC $3.00/MF $0.50

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XIV. SUMS WITH THE TMS AND TM SUMMARY TABLES.
Self-instructional course.
Jun 64, 58p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V14

Unclassified report

See also AD-605 357.

Descriptors: (*Training devices, Instruction manuals), (*Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 357 Div. 23, 18, 30
OTS Prices: HC $4.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
OTC QUERY LANGUAGE. VOLUME XIII. COMPLEX SUMS WITH THE AIR UNIT TABLES.
Self-instructional course.
Jun 64, 118p
Contract AF19 628 2935, Proj. 7682, Task 768204
ESD TDR64 443 V13

Unclassified report

See also AD-605 337.

Descriptors: (*Training devices, Instruction manuals), (Programming languages, Training devices), (*Information retrieval, Air force operations), Teaching machines, Education, Programming (Computers), Languages.

AD-605 440 Div. 23
OTS Prices: HC $3.00/MF $0.75

Syracuse Univ., N. Y.
ADMINISTRATIVE MANAGEMENT OF ON-THE-JOB TRAINING IN THE UNITED STATES AIR FORCE.
Master's thesis,
by Howard Ray Seamens. Aug 64, 88p

Unclassified report

Descriptors: (*Personnel management, Air force training), (*Air force training, Personnel management), (*Management engineering, Air force personnel), Costs, Military requirements, Learning, Instructors, Testing, Motivation, Performance (Human).

The purpose of this paper is to present a general view of On-the-Job Training as it is conducted in the Air Force today; to show some of its strengths and its weaknesses; and to present some recommendations for strengthening the weaker links. The primary recommendation of reorganizing the training responsibility is a large adjustment relative to the other recommendations. However, a structural reorganization of units would not be necessary. The training units of the Air Training Command would be tenant units at the various command levels. They would report directly to Air Training Command and not be integrated into the command line of the using organization. It is hoped that the mentioned weaknesses and recommendations for improvement will stimulate investigation in these areas. In turn, these investigations will lead to further studies and further improvements in the area of on-the-job training. (Author)

AD-605 446 Div. 23, 32
OTS Prices: HC $5.00/MF $1.00

Boston Univ., Mass. School of Public Relations and Communication.
THE U. S. AIR FORCE INFORMATION OFFICER OVERSEAS: A NEED FOR SPECIAL APPLICATIONS OF INFORMATION TECHNOLOGY.
Master's thesis,
by John M. Connolly, Jr. 1964, 184p

Unclassified report

Descriptors: (*Public relations, Air force personnel), (*Air force personnel, Public relations), (*Foreign policy, Public relations), Education, Training, Language, Political science, Sociology, Military publications, Military organizations.

Of the more than 700 officers listed in the most recent Directory of Air Force Information Officers, approximately 130 were designated as serving in posts outside the continental limits of the United States. It is upon their duties and responsibilities, and the training, knowledge and skills needed to insure their best possible performance as U. S. represenatives abroad, that this thesis will focus.

AD-605 821 Div. 23, 28
OTS Prices: HC $1.00/MF $0.50

American Inst. for Research, Washington, D. C.
NORMATIVE DISTRIBUTIONS OF AQE APTITUDE INDEXES FOR HIGH-SCHOOL-AGE BOYS,
by Marion F. Shaycoft and Ernest C. Tupes. Jul 64, 19p
Contracts AF41 657 324 and AF41 609 1588, Proj. 7717, Task 771705
PRL TDR64 17

Unclassified report

Descriptors: (*Aptitude tests, Students), (*Air force personnel, Selection), Recruiting, Military personnel, Males, United States.

The Air Force Airman Qualifying Examination (AQE) yields 4 aptitude indexes (General, Administrative, Mechanical, and Electronics) which are used in the selective recruiting, enlistment, and initial assignment of basic airmen. This report presents distributions in percentile form of the four AQE aptitude indexes for nationwide groups of 12th grade boys, 18-year-old boys, and 15-year-old boys based on equivalent aptitude composites of Project TALENT tests. Distributions are also given for 12th grade boys by region of the country, and, for those planning to enlist immediately after high school graduation, by the branch of the military service in which they plan to serve. These data are designed to be useful to recruiters as indications of the aptitude potential available to them and to high school guidance counselors as an aid in interpreting AQE scores achieved by their students. (Author)

25. Physics

AD-605 135 Div. 25, 8
OTS Prices: HC $1.00/MF $0.50

Westinghouse Electric Corp., Elmira, N. Y.
APPLICATION OF LIGHT AND IMAGE INTENSIFICATION.
Technical rept. no. 43, 16 Oct-15 Nov 62,
by Z. Szepesi. 20 Nov 62, 4p
Contract N61339 562

Unclassified report

Descriptors: (*Image intensifiers (Electronics), Preparation), (*Photoelectric materials, Image intensifiers (Electronics)), Laminates, Photoconductivity, Cadmium compounds, Selenides, Powders, Sintering, Lead compounds, Chlorides, Spraying, Sensitivity, Light, Gain.

Several grooved and sandwich type image intensifier panels were fabricated in sizes up to 4 in. x 4 in. Pure CdSe proved to be better for filling up the grooves above the PC layer than ZnO. Repetitive spraying and sensitizing of the sandwich PC layer improved the characteristics, and maximum gains of 35 ft.-Lamberts per ft-candle were measured on the best spots of the sandwich panels. A series of experiments were started using PbCl2 instead of CdCl2 as an impurity in the CdSe sintered PC layer. (Author)

AD-605 137 Div. 25, 4, 14
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Redondo Beach, Calif.
LIQUID LASER RESEARCH.
Bimonthly progress rept. no. 2, 1 May-30 Jun 62,
by Maurice W. Windsor. 30 Jun 62, 6p
STL-8657-6002-RU000
Contract AF04 695 97

Unclassified report

Descriptors: (*Lasers, Liquids), Glass, Plastics, Organic compounds, Acrylic resins, Complex compounds, Europium compounds, Chemical bonds, Rods, Low-temperature research.

Recent theoretical considerations indicate that low temperatures may greatly increase the possibility of observing stimulated emission for such compounds as benzophenone. Experiments on rigid solutions of benzophenone in EPA (ether, isopentane and ethyl alcohol in the volume ratio 5:5:2) were continued. On the preparative side a number of new plastic systems were made. Optical quality rods of cross-linked polymethyl methacrylate containing benzophenone, naphthalene and benzophenone/naphthalene mixtures at several concentrations were prepared. Experiments on incorporating organic rare-earth chelates into plastics were continued. The europium chelate of orthohydroxy benzophenone was synthesised.

AD-605 159 Div. 25, 4, 9
OTS Prices: HC $7.00/MF $1.50

Johns Hopkins Univ., Baltimore, Md.
ANALOG COMPUTER RESEARCH INTO THE ENERGY-EXCHANGE BETWEEN GASES AND SOLIDS.
Scientific rept.,
by Milton Rogers. May 64, 316p
Contract AF49 638 496
AFOSR 1001

Unclassified report

Descriptors: (*Transport properties, Thermodynamics), (*Energy, Transport properties), Gases, Solids, Particles, Fluid mechanics, Temperature, Surfaces, Chemisorption, Adsorption, Mathematical analysis, Analog computers.

A comparison is made between various models of the interaction. A description is given of the circuitry and techniques used to investigate the problem of energy exchange between gases and solids. Bounds on the applicability and interpretation of data obtained solely from computational experiments, whether performed with an analog or a digital computer, are delineated in some detail. Data are presented which was obtained in a series of analog computer experiments in gas surface interactions using several variations of a very simple model of the interaction potential, the lattice, and the physical state of the solid, particularly temperature. For the majority of the research, a non-linear coupling (potential) was used between gas particles and surface atom. Several major approximations were made in the formulation of the models investigated.

AD-605 191 Div. 25, 8
OTS Prices: HC $1.00/MF $0.50

Westinghouse Electric Corp., Elmira, N. Y.
APPLICATION OF LIGHT AND IMAGE INTENSIFICATION.
Technical rept. no. 44, 16 Nov-15 Dec 62,
by Z. Szepesi. 26 Dec 62, 8p
Contract N61339 562

Unclassified report

Descriptors: (*Image intensifiers (Electronics), Preparation), (*Photoelectric materials, Image intensifiers (Electronics)), (*Luminescence, Image intensifiers (Electronics)), Laminates, Photoconductivity, Electrical properties, Light, Amplifiers, Gain, Electrodes, Gold.

The drawbacks of the grooved type construction of the image intensifier became evident in the last experiments (see AD-605 135). On the other hand, recent measurements gave hope that the gain in the sandwich type construction can be increased by a factor of more than ten. Therefore, it was decided to discontinue the work with the grooved type, and do more systematic work for the improvement of the sandwich type construction. This work led to some improvements in the PC characteristics, and gains up to 170 ft. Lambert per ft-candle were measured on elementary PC-EL light amplifiers. (Author)

AD-605 200 Div. 25, 6, 14
OTS Prices: HC $1.00/MF $0.50

General Telephone and Electronics Labs., Inc.,
Bayside, N. Y.
INVESTIGATION OF PHOTOCONDUCTOR MATERIALS FOR A SOLID-STATE SONAR DISPLAY.
Quarterly interim development rept. no. 1, 13 Apr-12 Jul 64.
14 Aug 64, 16p GTEL-TR64-210.4
Contract NObsr91167, Proj. SF0070502, Task 9457

Unclassified report

Continuation of Contract NObsr85430.

Descriptors: (*Photoelectric materials, Display systems), (*Display systems, Sonar), Electroluminescence, Semiconductor devices, Photoconductivity, Ceramic coatings, Cadmium compounds, Sulfides, Impurities, Copper, Performance (Engineering), Illumination

An investigation to develop and construct a solid-state sonar display of variable-persistence. The display device

24. Photography and Other Reproduction Processes

AD-605 184 Div. 24
OTS Prices: HC $4.00/MF $0.75

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A STUDY OF IMAGE QUALITY EVALUATION.
Final rept.,
by Melvin J. Mazurowski, Harry B. Hammill, and George H. Snider. Aug 64, 104p VE-1867-G-1
Contract AF30 602 3206, Proj. 6244, Task 624409
RADC TDR63 536

Unclassified report

Descriptors: (*Photographic images, Intelligibility), (*Photointerpretability, Measurement), (*Aerial photographs, Photointerpretability), Photographic grain, Density, Color photography, Photographic contrast, Resolution, Scanning.

The derivation of an approximate summary measure which would relate measurable photographic parameters to judgments of target interpretability was investigated. An alternative technique for the visual ordering of photographs according to image quality was also studied. Precise and approximate analysis techniques of microdensitometer data for obtaining measures of photographic quality parameters were developed for black and white photography and a brief investigation of the extension of these techniques to color images was conducted. Image quality parameter evaluation techniques are documented and some preliminary attempts to derive summary measure functions are discussed. (Author)

AD-605 366 Div. 24, 8
OTS Prices: HC $3.00/MF $0.75

RCA Defense Electronic Products, Princeton, N. J.
RESEARCH AND DEVELOPMENT ON PHOTOCONDUCTIVE PHOTO-TAPE.
Interim rept. no. 3, 1 May-30 Jul 64.
Aug 64, 84p
Contract AF33 657 11485, Proj. 6263, Task 626202

Unclassified report

See also AD-430 041.

Descriptors: (*Electrophotography, Materials), (*Photoelectric materials, Tapes), (*Aerial cameras, Electrophotography), Electron optics, Electrostatics, Photographic recording media, Arsenic compounds, Antimony compounds, Selenides, Photoconductivity, Photographic images, Electron beams, Focusing, Resolution, Electron guns, Electrodes, Bearings, Vacuum systems, Manufacturing methods.

This is the third interim engineering report on a continued program of research and development on photoconductive Photo-Tape. The purpose of the research and development effort is to advance the Photo-Tape program toward a flight demonstration-model camera and to demonstrate a higher level of system performance in the laboratory than that which has been possible in the past. The over-all engineering objectives can be divided into two primary areas, the first of which is the demonstration of specified performance levels in terms of available hard copy records out of the reproducer, using the laboratory models available. The second is to demonstrate the feasibility of building higher performance cameras based on the Photo-Tape concept by employing laboratory models of individual components. (Author)

AD-605 599 Div. 24, 26
OTS Prices: HC $2.00/MF $0.50

Aeronautical Chart and Information Center, St. Louis, Mo.
APPLICATIONS OF QUALITY CONTROL IN THE PHOTOGRAPHIC LABORATORY,
by Charles R. Meyer. Jun 64, 39p
ACIC TR101

Unclassified report

Descriptors: (*Aerial photography, Quality control), (*Quality control, Photography), Photographic equipment, Photographic analysis, Photographic emulsions, Photographic film, Photographic images, Photographic processing equipment, Photographic contrast, Photographic grain, Chemical analysis.

This report concerns advances and developments in quality control activities and techniques in a photographic laboratory, and discusses the purposes, procedures, experiments, methods and results of an integrated quality control system in the reproduction of aerial photography. It describes studies in the critical areas of inspection of photographic material, exposure-development guidance, rapid gamma determination and chemical analysis of processing solutions, made in order to establish suitable controls. A review of quality control activities in these limited areas of study illustrates the wide scope of photographic quality control made possible through standardization. The advantages of a complete system of control are indicated by the significant advances described. (Author)

AD-605 661 Div. 24
OTS Prices: HC $2.00/MF $0.50

Bausch and Lomb, Inc., Rochester, N. Y.
UNIT RECORD SCREENING VIEWER.
Final rept.,
by C. S. Axtell. Jun 63, 28p
Contract AF30 602 2612, Proj. 6244, Task 624412
RADC TDR63 347

Unclassified report

Descriptors: (*Still projectors, Design), Photographic images, Mirrors, Lenses, Resolution, Viewing screens, Cooling, Remote control systems, Reliability.

The Unit Record Screening Viewer is a high resolution, rear projection viewer designed primarily for screening large numbers of mounted 70 X 100 millimeter film chips. The photographic images and the human readable code recorded on the film chip are projected at a fixed 6.5X magnification on the integral screen. The motorized chip changer mechanism may be operated from either local or remote positions for sequential screening of up to 64 mounted chips when loaded in an appropriate magazine. Chip placement in the projection focal plane is accomplished by the use of an electro-mechanical shaft positioner containing a two position stop cam and pawl device. The large projection format required a novel condenser system utilizing rectangular shaped lenses allowing for space considerations. The film gate temperature is held within reasonable limits by the incorporation of a heat controlling multi-layer filter in the condenser system.

AD-605 234 Div. 25, 17
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INFLUENCE OF STRAIN RATE ON RESISTANCE TO DEFORMATION OF METALS AT IMPACT VELOCITIES OF 100 TO 1000 M/SEC,
by F. F. Vitman and V. A. Stepanov. 24 Aug 64, 26p
FTD MT64 217; TT 64 71286

Unclassified report

Edited machine trans. of mono. Nekotorye Problemy Prochnosti Tverdogo Tela, (Certain Problems of Strength of Solid Body) Moscow, 1959, p. 207-221.

Descriptors: (*Metals, Impact shock), (*Impact shock, Deformation), (*Deformation, Metals), Strain (Mechanics), Hardness, Mechanics, Velocity, Penetration, Plasticity, USSR.

By means of penetration, the role of velocity in the problem of the resistance level of metals to plastic flow is investigated. It is shown that impact velocities in the range of 100 to 1,000 m/sec encounter inertial resisting forces and forces of natural resistance to deformation.

AD-605 241 Div. 25, 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE INTERACTION OF SHOCK WAVES,
by R. A. Antonova, E. M. Barkhudarov, B. P. Zhvaniya, G. I. Rostomashvili, and N. L. Tsintsadze. 21 Aug 64, 10p
FTD MT64 19, TT 64 71293

Unclassified report

Edited machine trans. of Zhurnal Tekhnicheskoi Fiziki (USSR) 1963, v. 33, no. 9, p. 1137-1138.

Descriptors: (*Shock waves, Physical properties), Electric discharges, Reflection, Luminescence, Photographic analysis, USSR.

By the method of high-speed photoregistration, a study was made of the interaction of shock waves. It was shown that the character of interaction is analogous to the interaction of a shock wave with a wall. The relationships obtained in the case of a strong shock wave for speeds of reflected and incident waves coincide with those calculated for the interaction of a shock wave with a wall. In certain cases, behind the front of the reflected wave, there was observed an expansion wave. (Author)

AD-605 259 Div. 25, 4
OTS Prices: HC $2.00/MF $0.50

Oslo Univ. (Norway).
SOME THEORETICAL INVESTIGATIONS FOR CLOSED STATES OF THE NEGATIVE HYDROGEN ION. PART I.
Institute for Theoretical Physics (Physica Matematics) rept.
by John Midtdal. Feb 64 36p ITP(PM)-21
Grant AF EOAR32 64
AFOSR 64 1256

Unclassified report

Partly supported by Fridtjof Nansen's Fund for Advancement of Science.

Descriptors: (*Hydrogen, Atomic energy levels), (*Atomic energy levels, Hydrogen), Ions, Atomic orbitals, Electrons, Field theory, Perturbation theory, Matrix algebra.

Contents: previous investigations; coordinate systems and sets of wave functions; the singlet and triplet S-states of two s-electrons; the 1s2p(3)P state of a two-electron system; the states (2p) (2 3) P and 2p3p(3)P; perturbation theory expansion of the non-relativistic energy of the state (2p)(2 3)P.

AD-605 270 Div. 25, 12
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
LASER-SATELLITE REFLECTION PARAMETERS,
Environmental research papers,
by Robert L. Iliff. Jun 64, 22p
Proj. 7600
AFCRL 64, 475; AFCRL ERP23

Unclassified report

Descriptors: (*Lasers, Reflection), (*Satellites (Artificial), Reflectors), Light pulses, Light transmission, Attenuation, Communication satellites (Passive), Mirrors, Atmospherics, Nomographs, Optical tracking.

Satellites of various configurations are examined as possible laser reflectors. Attention is given to the nature of the reflected signal, atmospheric attenuation, and problems involved in aiming the laser. Nomograms are presented for the determination of the geometric attenuation of the signal as a function of laser divergence, range, target size, receiver aperture, and, where applicable, divergence caused by degraded corner reflector. (Author)

AD-605 276 Div. 25, 6, 15
OTS Prices: HC $1.00/MF $0.50

Naval Research Lab., Washington, D. C.
THE NUMERICAL COMPUTATION OF RADIATION IMPEDANCE OF ZONAL ARRAYS ON A HARD PROLATE SPHERIODAL BAFFLE.
Interim rept.
by S. Hanish. 27 Jul 64, 22p
Proj. RF001 03 44 4052
NRL 6108

Unclassified report

Descriptors: (*Transducers, Acoustic impedance), (*Numerical analysis, Transducers), Sound, Potential theory, Mechanical waves, Mathematical models, Special functions (Mathematical).

This report consists of two parts. In the first part the mechanical radiation impedance between 'tesseral section' sound sources in an acoustically hard prolate spheriodal baffle is analyzed and formulas derived for calculating the impedance in terms of prolate spheriodal wave functions. The particular case of the interaction between zonal sound sources is treated in detail. In the second part a complete numerical study is made of the interaction between eight zones on prolate spheriodal baffle 2.3 lambda long having a radius alpha at the equator such that ka nearly equals 3. The zones have an axial height of lambda/10 and are spaced lambda/10 units apart. Theoretical radiation impedance interaction coefficients are calculated, and tables are presented of mutual and self impedances of all eight zones. Theoretical acoustic beam patterns are calculated and plotted for the condition of equal zonal surface velocities. (Author)

AD-605 277 Div. 25, 7, 12, 17
OTS Prices: HC $1.25/MF $0.75

Naval Research Lab., Washington, D. C.

will utilize a layer of electroluminescent material to generate the output light and a control layer of photoconductive material which accepts an input illumination from a servo-driven 'wand.' An opaque enamel layer between the other two layers is used to prevent optical coupling between the display output light or ambient illumination and the control photoconductor. The required persistence characteristics were obtained with several of the photoconductor compositions tested. A number of materials were tested for the opaque enamel layer. Several of these displayed the required lack of interaction with the electroluminescent and photoconductor layers, as well as the required opacity. Test multielement display panels incorporating the most suitable photoconductor and opaque enamel materials were constructed. Evaluation of these panels indicated that display elements corresponding to both the smallest elements near the center of the display and the largest elements furthest from the center can be made with the required persistence range.

AD-605 205 Div. 25, 14
OTS Prices: HC $3.00/MF $0.75

Brown Univ., Providence, R. I. Div of Applied Mathematics.
A STRESS WAVE STUDY OF THE DILATATIONAL RESPONSE OF SOME VISCOELASTIC SOLIDS.
Technical rept. no. 8,
by J. M. Lifshitz. Aug 64, 62p
Contract Nonr562 30, SD86, Proj. NR064 450
Unclassified report

Descriptors: (*Viscoelasticity, Theory), (*Polyethylene plastics, Viscoelasticity), (*Acrylic resins, Viscoelasticity), (*Styrene plastics, Viscoelasticity), Stresses, Spheres, Deformation, Measurement, Detonation waves, Shear stresses, Dilatometers.

Measurements of the change of shape of spherically diverging stress pulses in polyethylene, polymethylmethacrylate, and polystyrene were made. The stress pulses were produced by the detonation of small explosive charges on blocks of these materials and the pulses were detected by the use of condenser microphones. The stress amplitudes were sufficiently small for the theory of linear viscoelasticity to apply and the attenuation and dispersion of the pulses enabled values to be obtained for the real and imaginary parts of the bulk modulus. Such measurements would be extremely difficult to carry out in this frequency range by any other means. It was found that for both polyethylene and polymethylmethacrylate the 'bulk loss' was about one fifth of the mechanical loss in shear, whilst for polystyrene the bulk losses were so small that the assumption of elastic behavior was as close as any other assumption and in this material the shear losses are also very small. (Author)

AD-605 206 Div. 25
OTS Prices: HC $2.00/MF $0.50

Brown Univ., Providence, R. I. Div. of Applied Mathematics.
NON-LINEAR VISCOELASTIC SOLIDS.
Technical rept. no. 9,
by R. S. Rivlin. Aug 64, 48p
Contract Nonr562 30, Proj. NR064 450
Unclassified report

Descriptors: (*Viscoelasticity, Nonlinear systems), (*Continuum mechanics, Viscoelasticity), Solids, Deformation, Stresses, Theory, Vector analysis, Matrix algebra, Reviews.

The classical theories of the mechanics of deformable materials are, for the most part, linear theories and ones in which the stress depends only on the kinematic situation existing at the time of measurement of the stress. For many materials, such as viscoelastic solids and liquids, these assumptions are not valid. Considerable advances have recently been made in formulating the continuum mechanics of such materials. An account of this work is given, particularly in relation to viscoelastic solids. (Author)

AD-605 218 Div. 25, 15, 31
OTS Prices: HC $2.00/MF $0.50

Polytechnic Inst. of Brooklyn, N. Y.
UNIFORM OVAL REINFORCING RINGS - POWER SERIES EXPANSIONS,
by William P. Vafakos and Louis Rostand. Aug 64, 42p PIBAL-697
Contract Nonr839 14, Grant NSF G21876, Proj. NR064 167
Unclassified report

Descriptors: (*Reinforcing materials, Rings), (*Cylindrical bodies, Structural shells), (*Rings, Numerical analysis), (*Power series, Series), Elasticity, Stresses, Mechanical properties, Geometry, Loading (Mechanics), Ships, Scientific research.

Power series expansions are employed in the analysis of oval reinforcing rings which are arbitrarily located on the inside or outside of oval cylindrical shells of prescribed cross section. The expansions are in terms of two small geometric parameters which are fixed by specifying the cross section of the ring and the major and minor axis lengths of the oval. Analytical solutions are presented for the case of a uniform radial load. A graphical comparison is made with the results of a relatively lengthy energy solution. In addition, the effect of inside or outside rings is displayed in graphs, where the results are plotted versus the major-to-minor axis ratio. (Author)

AD-605 232 Div. 25
OTS Prices: HC $9.35/MF $2.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TESTING OF FERROMAGNETIC MATERIALS (MAGNETIC MEASUREMENTS)
by I. I. Kifer. 19 Jun 64, 595p
FTD TT63 531, TT 71292
Unclassified report

Unedited rough draft trans. of Ispytaniya Ferromagnitnykh Materialov (Magnitnye Izmereniya) Moscow/Leningrad, 1962, 544p.

Descriptors: (*Ferromagnetic materials, Magnetic properties), Magnetic fields, Measurement, Magnets, Metals, Alloys, Inductance, Magnetism, Circuits, Hysteresis, Test methods, Non-destructive testing.

This book is devoted to an investigation of the characteristics that determine the behavior of ferromagnetic materials in a magnetic field, ferromagnetic materials, general problems of testing magnetically soft materials, experiments at elevated frequencies and with magnetization in a constant magnetic field. The second edition refers additionally to new techniques of measurement and to apparatus that has become available during the last few years. The chapter 'Methods of Magnetic Flaw Detection' has been added; this is concerned with the fundamentals of magnetic flaw detection and, in particular, with the eddy current technique, which shows great promise for widespread introduction of flaw detection into engineering. The book is intended for technical personnel and students in institutions of higher education. (Author)

properties, Physical properties, Oceanology, Data, Programming languages, Attenuation, Underwater sound signals, Test methods.

This report describes a computer program for the calculation of underwater sound propagation. Ray tracing methods are used to compute the transit time, direction and location of ray bundles. The problem is assumed to be two-dimensional, i.e., the sound comes from a point source and the ocean properties are assumed to vary only with the depth and horizontal distance (range) from the source. The program treats four kinds of special effects. They are surface effects, bottom effects, sharp interfaces or layers, and regions of strong focussing (caustics). The surface and bottom effects are normally treated using energy conservation principles but the program allows for the inclusion of arbitrary loss coefficients. The sections of this report set forth the mathematical and numerical techniques used to solve this problem and show how to use the computer program.

AD-605 334 Div. 25
OTS Prices: HC $2.00/MF $0.50

Kansas Univ., Lawrence.
EXPERIMENTAL STUDY OF SPIN-LATTICE RELAXATION BY THE ORBACH PROCESS IN NEODYMIUM MAGNESIUM NITRATE.
Technical rept no. 6,
by J. T. Hoffman and R. C. Sapp. 25 Aug 64, 34p
Contract Nonr2775 00, Proj. NR018 202
Unclassified report

Research assisted by the National Science Foundation and by a grant-in-aid from the Alfred P. Sloan Foundation.

Descriptors: (*Paramagnetic materials, Relaxation time), (*Neodymium, Paramagnetic resonance), (*Single crystals, Paramagnetic resonance), Crystal lattices, Nuclear spins, Neodymium compounds, Magnesium compounds, Nitrates, Magnetic properties, Coils, Inductance, Electric bridges, Magnetic fields, Cryogenics, Specific heat.

Measurement was made of the spin-lattice relaxation time of trivalent Nd ions in Nd-Mg nitrate by fitting Casimir-du Pre dispersion curves to the frequency dependence of the self-inductance of a coil into which the sample could be inserted. The difference in self-inductance, with and without the sample, was determined by a modified Owen bridge at liquid helium temperatures and in fields between zero and 1800 oe. In the 3.3-4.2K range the Orbach process dominates and is identified by its characteristic exponential inverse temperature variation. For H perpendicular to the crystal axis, good agreement was found with Orbach's theory for the magnetic field dependence of this process. As by-products of the experiments, determination was also made of the magnetic specific heat constant and the temperature-independent susceptibility. (Author)

AD-605 361 Div. 25
OTS Prices: HC $5.00/MF $1.00

Stanford Univ., Calif. Div. of Engineering Mechanics.
MOVING CONTACT PROBLEMS OF A RIGID PROFILE ON A VISCOELASTIC BASE,
by J. N. Goodier and C. B. Loutzenheiser.
Jul 64, 192p SUDEM-148
Contract Nonr225 29, Proj. NR064 241
Unclassified report

Descriptors: (*Viscoelasticity, Loading (Mechanics)), (*Loading (Mechanics), Viscoelasticity), Cylindrical bodies, Elasticity, Deformation, Mathematical models.

Two-dimensional steady-state solutions (suitable for computer evaluation) are given for moving normal contact loads (sliding or rolling) on the surface of a semi-infinite viscoelastic base. Examples worked out include (a) the rigid cylinder rolling on a material haveng 5 relaxation times; (b) the flat punch with corners rounded to eliminate infinite pressures. The results for (a) show that the variation of rolling resistance over a range of velocities becomes smoother with the greater number of relaxation times. The results for (b) show the dependence of the pressure peaks, near the ends of the contact, on the nature of rounding of the corners and the tilt of the punch. Three dimensional solutions are considered for the purely viscous material. It is shown that there is a steady state for a base of finite thickness, but not for the semi-infinite base. (Author)

AD-605 365 Div. 25, 7
OTS Prices: HC $2.00/MF $0.50

Westinghouse Electric Corp., Pittsburgh, Pa.
LONG LIFE CLOSED LOOP MHD RESEARCH AND DEVELOPMENT UNIT.
Quarterly technical progress rept. no. 10, 1 Jun-31 Aug 64,
by R. L. Hundstad, F. A. Holmes, and M. G. Fey.
31 Aug 64, 26p
Contract AF33 657 8311, Proj. 8173, Task 817306
Unclassified report

See also AD-605 255

Descriptors: (*Magnetohydrodynamics, Generators), Plasma physics, Test facilities, Thermocouples, Probes (Electromagnetic), Heaters, Refractory materials, Performance (Engineering).

The third test of the closed loop is described. The goal of gas conductivity in the generator of one mho per meter was met and exceeded, achieving a value approximately one hundred times better than the previous test. Details of the test are presented along with planned improvements for the next test. (Author)

AD-605 377 Div. 25, 4
OTS Prices: HC $3.00/MF $0.50

Institute of Rubber Research, Univ. of Akron, Ohio.
MOLECULAR STRUCTURE AND PHYSICAL BEHAVIOR OF POLYMERS,
Rept. for 1 Feb-31 Dec 63,
by P. Dreyfuss, A. N. Gent, N. N. -C. Hsu, and V. V. Vickroy. Mar 64, 52p
Contract AF33 657 10868, Proj. 7342, Task 734203
ML TDR64 19
Unclassified report

Descriptors: (*Polymers, Molecular structure), (*Crystallization, Polymers), Chemical bonds, Elasticity, Melting, Vulcanizates, Temperature, Microscopy, Spheres.

Eleven model copolymers were prepared and their crystallization behavior studied. The crystallization followed simple Avrami kinetics, with the rate depending primarily on the degree of supercooling. The amount of crystallinity varied with temperature in a complex manner. Microscopy revealed generally a fine-grained structure, with resolvable spherulites only in certain cases. Crosslinked and uncrosslinked samples of trans 1,4 polyisoprene were studied dilatometrically. The melting temperatures of both the alpha and beta crystal forms were decreased by crosslinking, by about equal amounts. The rates of crystallization were also markedly decreased, roughly in

HIGH TEMPERATURE PROPERTIES OF SODIUM, POTASSIUM, AND CESIUM.
Progress rept. no. 14, 1 Jan-31 Mar 64,
by J. P. Stone, C. T. Ewing, J. R. Spann, E. W. Steinkuller, and D. D. Williams. 3 Aug 64, 62p
Contract NASA C76320
NRL 6128

Unclassified report

Descriptors: (*Liquid metals, Electric power production), (*Sodium, Thermodynamics), (*Potassium, Thermodynamics), (*Cesium, Thermodynamics), (*Thermodynamics, Alkali metals), High-temperature research, Vapors, Vapor pressure, Volume, Temperature, Density, Liquids, Equations of state, Enthalpy, Entrophy, Specific heat, Experimental data, Liquid metals, Tables, Molecular properties.

A program is in progress at this Laboratory to measure various thermophysical properties of sodium, potassium, cesium, and their vapors. Experimental values are presented for the pressure-volume-temperature properties of sodium vapor and the density of sodium liquid. Two equations of state are advanced for sodium, and properties of the saturated and superheated vapor are derived from these equations by a thermodynamic treatment, which is presented in outline form. Enthalpy, entropy, specific volume, and specific heat and compositional information (weight fraction of dimer, weight fraction of tetramer, and average molecular weight) are tabulated for some 800 selected vapor states in the temperature range from 1625 to 2575 F, and in the pressure range from 0.2 to 26 atm. Similar tables for potassium, which were previously reported in the Twelfth Progress Report, were computed from a saturated liquid base. These tables have been recomputed using properties of the monomeric gas as a base, and are published in this report. (Author)

AD-605 285 Div. 25
OTS Prices: HC $3.00/MF $0.75

Colorado Univ., Boulder.
LITERATURE SURVEY OF ORTHOHYDROGEN AND PARAHYDROGEN RESEARCH,
by P. L. Barrick and L. F. Brown. Aug 64, 68p
Contract AF33 616 7654, Proj. 1 10 3048, Task 30193
APL TDR64 81

Unclassified report

Prepared in cooperation with Air Products, Inc. Report contains a survey of the technical literature pertaining to orthohydrogen and parahydrogen from 1928 through October 1963.

Descriptors: (*Hydrogen, Molecular properties), Reviews, Cryogenics, Catalysis, Transformations, Theory, Quantum mechanics, Nuclear spins, Physical properties, Bibliographies, Abstracting.

A survey of the technical literature pertaining to orthohydrogen and parahydrogen is presented. The survey covers the literature from the prediction of the existence of the two forms of hydrogen in 1929 through October, 1963. The abstracts are presented in five categories: ortho to parahydrogen conversion, para to orthohydrogen conversion, theories and mechanisms relating to ortho-para and para-orthohydrogen conversion, properties of ortho and parahydrogen, and reviews and miscellaneous. (Author)

AD-605 296 Div. 25
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
STUDY OF TURBULENCE IN AN ARC PLASMA JET USING ELECTROMAGNETIC INDUCTION,
by A. E. Fuhs. 3 Aug 64, 32p TDR-269(4280-50)-1
Contract AF04 695 269
SSD TDR64 122

Unclassified report

Descriptors: (*Plasma jets, Turbulence), Electromagnetic fields, Inductance, Probes (Electromagnetic), Signals, Velocity, Measurement, Transducers, Integral equations, Partial differential equations.

Interaction of a turbulent conducting gas with a steady applied magnetic field drives fluctuating currents. The unsteady magnetic field arising from these currents induces a voltage e in a sensing coil. An integral equation for e and the related partial differential equation for the electrical potential are derived. A relation between signal rms magnitude and jet properties is discussed. Experiments were conducted using an arc plasma jet operating with argon. Most of the signal was due to frequency components in the interval 10 to 100 kc. By use of two transducers, one located downstream of the other, the average jet velocity was measured. The delay giving the peak value of the cross correlation function formed from the two signals was taken as the transit time. Methods for electronically determining the time delay are described. (Author)

AD-605 302 Div. 25, 20
OTS Prices: HC $1.00/MF $0.50

Massachusetts Inst. of Tech., Cambridge.
FISSION FRAGMENT DAMAGE IN URANIUM DOPED GERMANIUM.
Annual technical rept.,
by Robert E. Ogilvie. 1 Jul 64, 20p
Contract Nonr1841 84, Proj. NR031 686

Unclassified report

Descriptors: (*Germanium, Radiation damage), (*Crystal lattice defects, Germanium), Uranium, Impurities, Fission products, Copper, Energy, Distribution, Space charges, Hall effect, Electrical properties, Single crystals, Semiconductors.

A theoretical model for the spatial distribution of fission fragment damage in bulk crystals of copper and germanium was developed. Calculations of the energy distribution of primary knock-on atoms and of the range and energy loss of such atoms in the lattice are combined to determine the radial Frenkel defect concentration in a cylindrical fission spike. The radial strain field associated with such a defect concentration is also calculated and applied to the theory of diffraction contrast of fission tracks in the electron microscope. Several experimental studies of fission damage in bulk materials are discussed in the light of the proposed model. (Author)

AD-605 328 Div. 25, 26, 30
OTS Prices: HC $3.00/MF $0.75

Little (Arthur D.) Inc., Cambridge, Mass.
COMPUTER PROGRAM FOR ACOUSTIC RAY TRACING,
by R. Kronauer, L. C. Lawrence, and J. E. Murphy.
Jul 64, 96p ALI-1470764
Contract NObsr81564

Unclassified report

Rept. on Proj. TRIDENT.

Descriptors: (*Underwater sound, Sound transmission), (*Programming (Computers), Acoustics), (*Acoustics, Programming (Computers)), Differential equations, Functions, Numerical analysis, Reflection, Surface

value of T sub c decreased slowly with EuRu2 concentration, being 4.67K for a specimen containing 50% EuRu2. Upper and lower critical field values were found for all of these samples. There was a hysteresis in the value of T sub c measured in zero field not attributable to superheating and supercooling, which indicated the presence of ferromagnetic ordering. The relation between the specimen structure and behavior is discussed. The results indicate that ferromagnetic superconductivity may be possible in an homogeneous material. (Author)

AD-605 450 Div. 25, 15
OTS Prices: HC $1.00/MF $0.50

Brown Univ., Providence, R. I.
BOUNDS ON THE RATE OF ENERGY DISSIPATION IN BODIES DEFORMING BY SECONDARY CREEP.
Technical rept. no. 38,
by W. R. Hodgkins. Aug 64, 22p
Contract Nonr562 20, Proj. NR064 424
Unclassified report

Descriptors: (*Creep, Mathematical analysis), (Materials), Creep), Energy, Stresses, Strain (Mechanics), Loading (Mechanics), Tensor analysis, Deformation.

The present note extends previous methods of bounding the rate of energy dissipation in a body deforming under secondary creep according to a power law (strain-rate tensor = b signa to the n power). By an appropriate definition of the 'representative stress', bounds for a material with an arbitrary value of n are expressed in terms of a postulated known solution to the identical stress loading problem for a material with a different value of n. The results are applied first to idealised materials where n is a constant, and then extended to a class of non-idealised materials where n is a monotonic increasing function of stress. (Author)

AD-605 464 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ABOUT A CERTAIN PROBLEM OF THE NONLINEARLY CREEPING CONICAL SHELL OF REVOLUTION,
by R. M. Kirakosyan. 12 Aug 64, 10p
FTD TT64 200; TT 64 71313
Unclassified report

Unedited rough draft trans. of Akademiya Nauk Armyanskoi SSR, Erevan. Doklady, 1963, v. 37, no. 3, p. 151-156.

Descriptors: (*Bodies of revolution, Creep), (*Conical bodies, Structural shells), (*Creep, Conical bodies), Mathematical analysis, Integral equations, Stresses, Compressive properties, Deformation, Nonlinear systems, USSR.

In this article on the basis of the momentless theory of shells, there is discussed the creep of a conical shell of revolution under the action of a normal surface load slightly changing in time, when one end of the shell is fastened and the other is extended (compressed) along the generatrices. For the theory of creep use the theory nonlinear consecutively. The solution of the problem is reduced to the determination of one function of integration, in connection with which, a nonlinear integral equation is obtained. In the case where the circular stresses in magnitude exceed the elastic-instantaneous longitudinal stresses, (the latter are assumed to be compressive) in passing over in the equations of creep from the intensity of tangential stresses to the magnitude near to it, for the maximum tangential stress the precise solution is given in the closed form.

AD-605 466 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
GAS AND LIQUID LASERS,
by Chao-shou Tseng. 13 Aug 64, 10p
FTD TT64 565, TT 64 71314
Unclassified report

Edited trans. of K'o Hsueh Ta Chung (Chinese People's Republic) 1963, no. 11, p. 22-23.

Descriptors: (*Lasers, Reviews), Gases, Liquids, Light communication systems, China.

A popularized review of the basic principles of gas and liquid lasers.

AD-605 467 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
VACUUM APPARATUS FOR THE GERMINATION OF DENDRITIC STRIPS FROM SEMICONDUCTIVE MATERIALS,
by Yu. M. Shashkov, B. I. Abaev, V. P. Grishin, A. V. Bakun, and V. V. Khartulari. 6 Aug 64, 6p
FTD TT64 629, TT 64 71316
Unclassified report

Unedited rough draft trans. of Russian patent 157785 (appl. 770107/22-2, 22 Mar 62).

Descriptors: (*Vacuum apparatus, Semiconductors), (*Single crystals, Crystal growth), (*Semiconductors, Material separation), Design, Patents, USSR.

A vacuum apparatus for germinating dendritic strips out of semiconductor materials is described. The apparatus consists of a vacuum chamber in the cavity of which is a crucible with the original material fastened on a movable rod, a heater, and a rod. For the purpose of increasing the productivity of the apparatus in the cavity of the vacuum chamber there is eccentrically set a container which makes a turning movement in the horizontal plane for the collection of the cutoff strips, and in the wall of the chamber is mounted an attachment for cutting off the germinated strips from the seeding with the aid of an electric arc, designed in the form of two electrodes fastened on the end of the metallic tube and a rod set inside of it electrically insulating one from the other. (Author)

AD-605 468 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CURRENT PROBLEMS IN CRYSTALLOGRAPHY,
by B. K. Vainshtein. 4 Aug 64, 19p
FTD TT64 589, TT 64 71317
Unclassified report

Unedited rough draft trans. of Akademiya Nauk SSSR. Vestnik, 1963, v. 33, no. 6, p. 31-38.

Descriptors: (*Crystallography, Reviews), Crystal substructure, Diffraction analysis, Crystal lattices, Lasers, Single crystals, Crystal growth, Crystallization, USSR.

accord with the reduced melting temperatures. Crystallization was also observed in highly-swollen networks, without much exudation of solvent. The elastic behavior of crosslinked polyethylene was examined. (Author)

AD-605 378 Div. 25, 17, 30
OTS Prices: HC $2.00/MF $0.50

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
A VACUUM EVAPORATOR FOR AN INVESTIGATION OF THE MAGNETO-OPTIC PROPERTIES OF INTERMETALLIC COMPOUND FILMS.
Rept. for Mar 62-Oct 63,
by Axel M. Stoffel and Karl J. Strnat. Jun 64, 30p
Proj. 7371, Task 737103
ML TDR64 130

Unclassified report

Descriptors: (*Thin films (Storage devices), Ferromagnetic materials), (*Ferromagnetic materials, Intermetallic compounds), (*Intermetallic compounds, Magneto-optic effect), (*Magneto-optic effect, Thin films (Storage devices)), (*Test equipment, Magneto-optic effect), Evaporators, Intermetallic compounds, Films, Magnetometers, Rare earth compounds, Computer storage devices, Vapor plating, Vacuum apparatus, Films.

This report describes an ultrahigh vacuum evaporator which is part of an apparatus for use in an investigation of the magneto-optical properties of ferromagnetic intermetallic compounds in thin film form. Samples can be prepared by vapor deposition from two sources and subsequent annealing in vacua of approximately 10 to the minus 9th power torr. A torque magnetometer built into the system can be used for magnetization measurements, and an external ellipsometer allows determination of magneto-optical constants on the films without removing them from the high vacuum in which they were prepared. (Author)

AD-605 414 Div. 25
OTS Prices: HC $3.00/MF $0.75

Philco Research Labs., Newport Beach, Calif.
LASER PUMPING SOURCES.
Final technical rept.,
by S. Byron, H. Shanfield, W. Lawrence, J. Killian, and D. Peters. 15 Jul 64, 93p U-2771
Contract Nonr4237 00, Proj. 3730, ARPA Order 306 62

Unclassified report

Descriptors: (*Lasers, Pumping (Electronics)), Explosions, Pyrotechnics, Shock waves, Energy conversion, Absorption spectrum, Cooling, Luminescence.

The direct conversion of stored chemical energy to radiation suitable for pumping laser materials was investigated. Both explosives and pyrotechnics were studied as well as the possibilities offered by combining the two. The emphasis was on gaining an understanding of the fundamental limitations in producing high radiation intensity, long pulse duration, and high overall energy conversion efficiency for these radiation sources.

AD-605 428 Div. 25, 2
OTS Prices: HC $2.00/MF $0.50

Woods Hole Oceanographic Institution, Mass.
ACOUSTIC TRANSIENTS AND IMPACT-ENERGIZED SOUND SOURCE RESEARCH.
Final rept.,
by Arnold G. Sharp. Jun 64, 46p WHOI Ref-64-23
Contract Nonr2672 00, Proj. NR385 905

Unclassified report

Descriptors: (*Underwater sound generators, Impact shock), (*Sound transmission, Impact shock), Design, Pressure, Drives, Underwater sound, Acoustic properties.

The program of underwater transient acoustics at the Woods Hole Oceanographic Institution has been concerned with the use of mechanical impact action to produce a short duration, positive pressure pulse of high intensity in the water. An experimental model impact-energized sound source, IMP Mod X-1, was designed and built at Woods Hole. Observed pressure-time curves were in good agreement with those predicted by impact theory. A larger, higher intensity sound source, IMP Mod X-2, is under construction. (Author)

AD-605 431 Div. 25
OTS Prices: HC $2.00/MF $0.50

American Optical Co., Southbridge, Mass.
FIBER OPTIC LASER.
Semiannual rept. no. 2, 1 Nov 62-29 Mar 63,
by Elias Snitzer. 29 Mar 63, 42p
Contract DA19 020ORD5575X, Proj. 3209

Unclassified report

Descriptors: (*Lasers, Fiber optics), (*Fiber optics, Lasers), (*Neodymium, Glass), Spectroscopy, Oscillation, Damping, Pumping (Electronics), Emissivity, Frequency, Control.

Some spectral and time properties of neodymium glass lasers of conventional geometry are described. The spectral output vs. pump power was investigated. The effect of temperature on the spectra and time traces was also looked at. The results of attempts to control the frequency of the laser emission are reported. Work on long single fibers and fused multifiber bundles was carried out. (Author)

AD-605 444 Div. 25
OTS Prices: HC $4.00/MF $0.75

Malaker Labs., Inc., High Bridge, N. J.
BASIC RESEARCH ON FERROMAGNETIC SUPERCONDUCTORS.
Final rept.
by John G. Daunt, James J. Drautman, Charles J. Anderson, and Samuel H. Stern. Aug 64, 124p
Contract AF30 602 2935, Proj. 8503, Task 850301
RADC TDR64 188

Unclassified report

Descriptors: (*Ferromagnetic materials, Superconductors), (*Superconductors, Ferromagnetic materials), (*Ruthenium alloys, Superconductivity), Cryogenics, Europium alloys, Gadolinium alloys, Cerium alloys, Electrical properties, Magnetic properties, Density, Transition temperature, Hysteresis, Crystal structure, X-ray diffraction analysis, Fluorescence, Photomicrography.

The electrical and magnetic properties of several alloys of EuRu2 or GdRu2 with CeRu2 were measured in the temperature range 1K - 30K and in applied magnetic fields up to 6 K0e. One sample of CeRu2 and several of GdRu2 - CeRu2 had a low density and exhibited an anomalous behavior. These specimens underwent an incipient superconducting transition and were either paramagnetic or ferromagnetic at temperatures below that of the superconducting transition. All of the europium samples had a high density and had sharp superconducting transitions in which the susceptibility became negative. The

Descriptors: (*Heat transfer, Numerical analysis), (*Partial differential equations, Heat transfer), (*Diffusion, Equations), Programming (Computers), Difference equations, Optimization, Numerical methods and procedures, Errors, Thermal conductivity.

This investigation compares the accuracy obtained using two implicit finite difference representations of the partial differential equation for transient heat conduction to obtain solutions to two basic conduction problems. The two representations considered are the Crank-Nicolson form and a theoretically more optimum form designated as the Optimum Implicit form. It is demonstrated that the major source of error occurs at the initial time/space node of the difference mesh. By decreasing this error, the Optimum Implicit form is shown to be as accurate as the Crank-Nicolson form in one problem, and considerably more accurate in the second. (Author)

AD-605 493 Div. 25
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
ANOMALOUS SPINOR EQUATIONS.
Scientific rept. no. 2,
by A. Peres. 14 Apr 64, 9p
Grant AF EOAR64 20
ARL 64 163

Unclassified report

Descriptors: (*Partial differential equations, Quantum mechanics), (*Quantum mechanics, Partial differential equations), Matrix algebra, Quantum statistics, Charged particles.

Two-component anomalous spinor equations, describing particles of non-vanishing mass, are derived from a generally covariant Lagrangian principle. Some properties of the solutions are discussed, and some difficulties are pointed out. (Author)

AD-605 494 Div. 25
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
COMMUTATION RELATIONS FOR ENERGY-MOMENTUM TENSOR.
Scientific rept. no. 4,
by A. Peres. 26 Apr 64, 7p
Grant AF EOAR64 20
ARL 64 165

Unclassified report

Descriptors: (*Tensor analysis, Electromagnetic fields), (*Field theory, Tensor analysis), Energy, Momentum, Electromagnetism, Groups (Mathematics).

In this article, it is shown that Schwinger's formula for (T(00) (x), T(00) (y)) cannot be generalized, in a covariant fashion, to the other components of the energy-momentum tensor. (Author)

AD-605 495 Div. 25, 15
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
COMMUTATION RELATIONS FOR ELECTROMAGNETIC POTENTIALS.
Scientific rept. no. 5,
by A. Peres. 26 Apr 64, 10p
Grant AF EOAR64 20
ARL 64 166

Unclassified report

Descriptors: (*Electromagnetic fields, Transformations (Mathematics)), (*Transformations (Mathematics), Electromagnetic fields), Operators (Mathematics), Identities, Partial differential equations, Photons.

Given the known (gauge-independent) value of F sub ab (x), F sub cd (y), we derive the most general expression for the commutator A sub a (X), A sub b (y). The latter contains four arbitrary functions N sub a (x, y), which, if suitably chosen, may yield the Coulomb gauge, the Feynman gauge, the Landau gauge, etc. It is however impossible to go over from one value of N sub a (x, y) to another by means of an operator gauge transformation, unless the difference between both values of N sub a satisfies some differential relations.

AD-605 501 Div. 25
OTS Prices: HC $7.00/MF $1.50

Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
A STUDY OF LATTICE VIBRATIONS THROUGH THE TEMPERATURE DEPENDENCES OF X-RAY BRAGG, INTENSITIES.
Technical rept. no. 3,
by R. M. Nicklow and R. A. Young. 20 Jul 64, 314p
Contracts Nonr991 00 and Nonr991 06,
Projs. NR017 623, A389

Unclassified report

Descriptors: (*Crystal lattices, Vibration), (*Single crystals, X-ray diffraction analysis), X-ray spectrum, Intensity, Temperature, Aluminum, Potassium compounds, Silver compounds, Chlorides, Thermal properties, Elasticity, Spectroscopy, Vector analysis.

New experimental and analytical techniques were developed for the study of thermal vibrations through measurements of the temperature dependences of Bragg intensities. These techniques were applied to the study of thermal vibrations in Al, Kcl, and Agcl in the 100 to 300K temperature range. These techniques involve the collection of precision intensity data at temperature intervals which are small enough to allow useful determination of the slope and curvature of the intensity versus temperature data. From these slopes it is possible to obtain meaningful values for the temperature derivatives, dB/dT, of the Debye-Waller factors for both a monatomic (copper type) structure and for each type of atom, individually in an NaCl type structure. The temperature dependences of these temperature derivatives were also experimentally observed and were particularly significant. These intensity-vs-temperature results were related in a straightforward way to the elastic frequency spectrum, and detailed comparisons were made with predictions based on the actual spectra in two cases. (Author)

AD-605 508 Div. 25
OTS Prices: HC $1.00/MF $0.50

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
THE ENERGY DECAY OF SOLUTIONS TO THE INITIAL-BOUNDARY VALUE PROBLEM FOR THE WAVE EQUATION IN AN INHOMOGENEOUS MEDIUM,
by B. B. Lieberman. Jun 64, 21p BR-45
Grant AF AFOSR537 64
AFOSR 64 1642

Unclassified report

Descriptors: (*Boundary value problems, Electromagnetic waves), (*Electromagnetic waves, Boundary value problems), Refractive index, Electromagnetic wave reflections, Integral equations, Operators (Mathematics), Differential geometry.

AD-605 471 Div. 25
OTS Prices: HC $7.00/MF $1.50

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
INTERPOLATIONS OF IMPERFECT AIR THERMODYNAMIC DATA. I: AT CONSTANT ENTROPY,
by C. A. Neel and Clark H. Lewis. Sep 64, 315p
Contract AF40 600 1000, Proj. VT8002
AEDC TDR64 183

Unclassified report

Descriptors: (*Air, Thermodynamics), (*Entropy, Air), (*Tables, Thermodynamics), Shock waves, Velocity, Numerical analysis, Data.

The recent thermodynamic air data of Hilsenrath and Klein (AEDC-TDR-63-161) and the previous low temperature data of Humphrey and Neel (AEDC-TN-61-103) have been interpolated at constant entropy over the ranges T = 100(100) 15,000K and S/R = 15.6(0.2)50, 50(1)133. Speed of sound data computed by Lewis and Neel (AEDC-TDR-64-36) are also included. (Author)

AD-605 474 Div. 25, 20
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech. Haifa.
CONSTANCY OF e to the 2nd power/hc IN A GRAVITATIONAL FIELD.
Scientific rept. no. 3,
by A. Peres. 26 Apr 64, 8p
Grant AE EOAR64 20
ARL 64 164

Unclassified report

Descriptors: (*Gravity, Nuclear physics), (*Nuclear physics, Gravity), Relativity theory, Potential theory, Protons, Electrons, Equations, Physics.

It is shown that if the fine structure constant depends on the gravitational potential V as (1 + k V/c to the 2nd power), then the experimental limit on k is at most 10 to the minus power. Similar results hold for the proton/electron mass ratio and many other dimensionless physical constants. (Author)

AD-605 475 Div. 25, 20
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
INEQUIVALENCE THEOREM IN QUANTUM FIELD THEORY.
Scientific rept. no. 8,
by A. Peres. 23 Jun 64, 12p
Grant AF EOAR64 20
ARL 64 169

Unclassified report

Descriptors: (*Field theory, Mathematical analysis), Theorems, Partial differential equations, Perturbation theory, Elementary particles, Quantum mechanics, Physics.

In practice, the most useful approach to quantized fields has been perturbation theory, embodied in the form of Feynman diagrams. The purpose, in this paper, is just to experiment, with the help of Feynman diagrams, the physical consequences of the addition of a four-divergence to a Lagrangian.

AD-605 485 Div. 25, 12, 13
OTS Prices: HC $3.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PROJECT COLD SHOT, PARTICLE THERMAL RADIATOR.
Master's thesis,
by Garrett Wilbur Durling, Jr. Aug 64, 62p
AFIT GA/Phys/64 1

Unclassified report

Descriptors: (*Heat transfer, Metals), (*Radiators, Spacecraft), (*Thermal radiation, Heat transfer), Particles, Surface properties, Metal plates, Heating, Vacuum, Thermodynamics, Equations.

The heating of small metallic particles during impact on a charged hot surface is studied experimentally. A proposed radiator design for space application used particles heated in this manner to produce a light weight radiator with a large radiating surface. Previous theoretical studies of this design assumed that the particle was heated to almost 100% of the hot surface temperature before being repelled from the surface; the purpose of this study was to investigate that assumption. In a vacuum of three micromillimeters of mercury the particles were bounced off a surface on which a temperature as high as 155C and a perpendicular electric field as high as 100,000 volts per meter were maintained. The particles were collected in a calorimeter where the amount of heat gained by them was measured. Negligible heat transfer was indicated with typical test results showing a change in particle temperature of 0.45± 0.89C and a heat gain of only 0.37± 0.72% of the amount required to raise the particle temperature up to that of the hot surface. (Author)

AD-605 488 Div. 25, 2, 20
OTS Prices: HC $4.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PARTICLE SIZE DETERMINATION BY USE OF ELECTROSTATIC PRECIPITATION PATTERNS AND RADIOACTIVE TRACERS.
Master's thesis,
by Gonzalo Fernandez. Aug 64, 123p
AFIT GA/Phys/64-2

Unclassified report

Descriptors: (*Radioactive isotopes, Particle size), (*Electrostatic precipitation, Tracer studies), Dust, Samplers, Airborne, Mathematical models.

The purpose of the work was to determine the validity limits of a previously derived theoretical model of an electrostatic precipitator air sampler. The theoretical model was investigated by insertion of radioactive micron-size microspheres into a closed-loop wind tunnel, whose airstream flows into an electrostatic precipitator. The precipitation pattern on the collection plates was determined by the pattern of radioactivity. Ideally, the particles should be segregated by size. The results were compared to the theoretical predictions which are calculated with a digital computer program. Conclusions are that (1) the results are reproducible within experimental error; (2) the physical phenomena in the precipitator can be described by mathematical models as suggested in the original theoretical study; (3) mathematical models being used are probably imperfect; and (4) investigation of the validity of the theoretical model should continue. (Author)

AD-605 489 Div. 25, 15
OTS Prices: HC $4.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN INVESTIGATION OF THE ACCURACY OF NUMERICAL SOLUTIONS IN THE DIFFUSION EQUATION FOR TRANSIENT HEAT TRANSFER.
Master's thesis,
by Bart C. Campbell. Aug 64, 118p
AFIT GSF/Phys/64-1 Unclassified report

THE ANALYSIS OF VARIABLE RELUCTANCE TRANSDUCERS: THE CLASSICAL METHOD,
by R. M. Moore. 25 Aug 64, 34p
Proj. 001 03 44 4052
NRL 6088 Unclassified report

Descriptors: (*Transducers, Electromagnetism), (*Electromechanical converters, Mathematical analysis), Inductance, Magnetic fields, Energy conversion, Electromagnetic fields, Integral equations, Nonlinear differential equations, Integrals, Equations, Electromagnetic properties.

The operating equations of a variable reluctance transducer are derived in this report through the application of classical electromagnetic theory. These equations are formulated in terms of inductance and a quantity called the the electrical force factor. The basic equations are shown to be nonlinear, and a set of approximate linear equations is derived for a special class of inputs. (Author)

AD-605 548 Div. 25, 15
OTS Prices: HC $2.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
ON THE DIFFERENTIAL EQUATIONS OF THE LINEAR THEORY OF ELASTIC SHELLS,
by P. M. Naghdi. Aug 64, 26p AM-64-15
Contract Nonr222 69, Proj. NR064 436
Unclassified report

Descriptors: (*Elastic shells, Theory), (*Differential equations, Elastic shells), Partial differential equations, Tensor analysis, Stresses, Strain (Mechanics), Elasticity.

A system of basic equations of the linear banding theory of thin elastic shells, derived under the Kirchhoff-Love hypothesis, is employed which involves only symmetric shell-strain measures and symmetric stress and couple resultants. The basic equations are rigorously reduced to a general system of forth order complex partial differential equations in terms of a symmetric second order complex tensor and its conjugate. The results appear to be attractive from the point of view of application to special problems. (Author)

AD-605 562 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
PLASMAS OSCILLATIONS AND DISPERSION IN THE PRESENCE OF A MAGNETIC FIELD,
by Myron Kantor. 26 Nov 58, 20p
STL-GM-TR-0165-00526
Contract AF04 647 165 Unclassified report

Descriptors: (*Plasma oscillations, Equations), Magnetohydrodynamics, Propagation, Plasma medium, Electrons, Ions, Magnetic fields, Vector analysis, Polynomials.

A study is made of harmonic oscillations which may exist in a fully ionized, collision-free, homogeneous plasma subjected to a steady magnetic field. The plasma consists of a binary mixture of electrons and ions for which electrical neutrality is preserved. The system is described by writing the Maxwell second-order electrodynamic wave equation and the linearized equations of macroscopic motion of the particles. By transforming the vector equations to a homogeneous set of scalar algebraic equations and equating the determinant of the system to zero, one obtains for the characteristic equation of the plasma a quartic in the square of the propagation vector. This fourth degree polynomial implies, in general, the existence of four distinct modes of plasma wave propagation. It is shown that the various kinds of hydromagnetic waves, including positive-ion oscillations and Alfven waves, all belong to the fundamental or lowest of the four modes of propagation. In general, the group and phase velocities are frequency dependent (the medium is dispersive) and are complicated functions of the angle between the steady magnetic field and the propagation vector or wave normal. (Author)

AD-605 566 Div. 25
OTS Prices: HC $4.00/MF $1.25

Motorola, Inc., Phoenix, Ariz.
RESEARCH AND DEVELOPMENT FOR SEMICONDUCTOR SURFACE CONTROL AND STABILIZATION.
Scientific rept. no. 1,
by K. D. Kang, F. Lee, and H. W. Cooper.
14 May 64, 132p
Contract AF19 628 3808, Proj. 4608, Task 460805
AFCRL 64 581 Unclassified report

Descriptors: (*Semiconductors, Surface properties), Germanium, Control, Stabilization, Oxides, Silicon, Semiconductor devices, Transistors, Diodes (Semiconductor), Electric currents.

The report describes the progress made during this period in semiconductor surface control and stabilization. The effects of contaminants upon beta and leakage current are discussed. Germanium planar passivation studies are also covered. Work on metal oxide semiconductors (MOS) and field effect transistors (FET) is reported. (Author)

AD-605 578 Div. 25, 12
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
ON THE VIBRATION OF THIN CYLINDRICAL SHELLS UNDER INTERNAL PRESSURE,
by Y. C. Fung. 14 Oct 55, 40p RW(AM)-5-8 Unclassified report

Descriptors: (*Vibration, Cylindrical bodies), (*Cylindrical bodies, Structural shells), (*Structural shells, Vibration), Pressure, Frequency, Resonance, Stresses, Stiffened cylinders, Equations, Mechanical engineering, Guided missile components.

It is shown that for thin cylinders the internal pressure has a very significant effect on the natural vibration characteristics. For these cylinders, particularly those having smaller length-to-diameter ratios, the mode associated with the lowest frequency is in general not the simplest mode. In fact, the frequency spectrum may be so arranged that the frequency decreases with an increase in the number of circumferential nodes. The exact number of circumferential nodes which occur in the mode associated with the lowest frequency depends on the ratios h/a, L/a, and the internal pressure, where h is the wall thickness, a is the cylinder radius, and L is the axial half-wave length. When the internal pressure is small, the number of circumferential nodes at the lowest frequency decreases rapidly with increasing internal pressure; and the 'fundamental' frequency - the lowest frequency at each internal pressure - increases rapidly with increasing internal pressure. At higher values of internal pressure the frequency spectrum tends to be arranged in the regular manner: the frequency increases with the increasing number of circumferential nodes; and the lowest frequency rises with the internal pressure, but at a slower rate.

AD-605 584 Div. 25
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command,

The paper is concerned with the decay of the energy of disturbances which are propagated according to the wave equation with varable index of refraction in the exterior of a finite star-shaped reflecting body. It is shown that the energy of the disturbance decays like some power of t to the minus 1. Certain conditons of growth and continuity are made on the index in order to insure some decay factor. The energy decay is obtained by estimating the solution of an integral equation which results when one applies the Friedrichs' 'A-B-C method' to the modified wave equation operator. Using the energy estimate with other familiar estimates, one obtains a rate of decay for the disturbance itself. (Author)

AD-605 529 Div. 25, 8
OTS Prices: HC $2.00/MF $0.50

Illinois Univ., Urbana. Engineering Experiment Station.
BEAM TRACING AND APPLICATIONS.
Antenna Lab. technical rept. no. 79,
by Georges A. Deschamps. Jun 64, 44p
Contract AF33 657 10474, Proj. 6278, Task 627801
Unclassified report

Descriptors: (*Beams (Electromagnetic), Transformations), (*Light transmission, Mathematical models), Resonators, Reflectors, Optical properties, Statistical processes, Graphics, Special functions (Mathematical), Wave transmission, Refraction, Lenses, Optics, Waveguides, Antennas, Lasers.

Graphical methods are introduced to describe the transformations of a beam as it goes through an optical system. The beams considered here are defined by a real Gaussian distribution of the field at some reference cross-section but can also include higher order modes defined by Hermite-Gaussian functions, or the 'beam-modes' considered by Goubau. A complex variance is introduced which describes at once the effective area of a cross-section of the beam and the curvature of its phase front. In free space propagation, and at the crossing of a leans, the complex variance transforms in a simple manner which may be compared to impedance transformation through a reactive ladder network. The graphical constructions described allow us to trace the variations of a beam cross-section and curvature through a system. They correspond to some formulas already given by Goubau but they lead to some insight in the operation of non-confocal resonators and beam waveguides with unequally spaced lenses. This is illustrated by several examples including the design of an antenna for concentrating in a narrow beam the radiation from a beam waveguide. Related graphical constructions for multi-transit resonators are presented and the resonance condition can be compared to that of higher mode resonances. (Author)

AD-605 530 Div. 25
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
QUANTUM ELECTRODYNAMICS WITHOUT INDEFINITE METRIC.
Scientific rept. no. 6,
by A. Peres. 7 May 64, 16p
Grant AF EOAR64 20
ARL 64 167
Unclassified report

Descriptors: (*Field theory, Electromagnetic fields), (*Electromagnetic fields, Field theory), Electromagnetism, Potential theory, S-matrix, Hamiltonian, Operators (Mathematics), Matrix algebra, Functional analysis.

The electromagnetic potentials A sub a (X) are quantized in such a way that their space components are hermitian and their time component anti-hermitian. On the other hand, the metric in Hilbert space and the Hamiltonian are positive definite. The above formalism, which leads to the usual commutator (A sub a (x), A sub b (y)) = ig sub ab D sub O (x-y), is shown to be Lorentz covariant. Physical states are those containing neither longitudinal nor scalar photons (rather than a symmetric combination of them, as in the usual theory). This definition is also Lorentz covariant. The S-matrix is not unitary, but satisfies PS*PSP=P, where P is the projection operator over physical states. In other words, the S-matrix is unitary over the subspace of physical states, this being sufficient for the interpretation of the theory. (Author)

AD-605 531 Div. 25
OTS Prices: HC $1.00/MF $0.50

Israel Inst. of Tech., Haifa.
MACROSCOPIC BODIES IN QUANTUM THEORY.
Scientific rept. no. 7,
by A. Peres and N. Rosen. 7 May 64, 14p
Grant AF EOAR64 20
ARL 64 168
Unclassified report

Descriptors: (*Quantum mechanics, Quantum statistics), (*Solids, Quantum mechanics), Experimental data.

It is shown that if the wavefunction of a massive body is u= c sub n u sub n where the sub n are macroscopically distinguishable states, then the observation of interferences between the various u sub n requires inconceivable laboratory conditions (e.g., the experiment may last longer than the life-time of the universe). It is therefore proposed to interpret c sub n u sub n as a mixture of states, and not as a superposition. This new interpretation of wavefunctions is consistent with experience and is free from the paradoxical features of the 'orthodox' measurement theory. (Author)

AD-605 532 Div. 25, 9
OTS Prices: HC $1.00/MF $0.50

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
FINAL REPORT. MACROSCOPIC MAGNETO-FLUID DYNAMICS ,
by J. Berkowitz and Harold Grad. Sep 64, 8p
Contract AF49 638 1006
AFOSR 64 1647
Unclassified report

Descriptors: (*Magnetohydrodynamics, Abstracts), Plasma physics, Fluid flow, Gas flow, Airfoils, Equations, Magnetic fields, Mathematical analysis.

A general program was undertaken to understand the mathematical structure and content of the basic equations of the subject, paying special attention to nonstandard mathematical problems which arise. The steady flow past a wedge was studied. The Mach cones in three dimensions were computed and found to be extremely singular. The flow past an airfoil, governed at certain intermediate speeds by a fourth order 'composite' system which is partly elliptic and partly hyperbolic, was studied. An extensive existence theory of the linear Boltzmann equation was developed using newly discovered estimates for the Boltzmann collison operator. Also, a detailed study of wave propagation using normal modes was made.

AD-605 547 Div. 25, 8, 15
OTS Prices: HC $0.75/MF $0.50

Naval Research Lab., Washington, D. C.

INVESTIGATION OF ANNULAR-TWO PHASE FLOW, AND HEAT TRANSFER TO AND FROM GASES WITH LARGE TEMPERATURE DIFFERENCES.
Final summary rept. for 1 Oct 59-1 Feb 61,
by C. F. Warner and J. M. Murphy. Mar 61,
27p JPC-F-61-1
Contract Nonr1100 14

Unclassified report

Descriptors: (*Heat transfer, Gas flow), Cooling, Coolants, Thermodynamics, Films, Rocket motors, Liquid cooled.

AD-605 627 Div. 25
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Service, Ottawa (Canada).
SECOND SOUND IN HELIUM II AT HIGH PRESSURES,
by V. P. Peshkov and K. N. Zinov'eva. May 58, 10p
NRC-C-2750
DSIS T281R; TT 64 71368

Unclassified report

Trans. of Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (USSR) 1948, v. 18, no. 5, p. 438-443.

Descriptors: (*Sound transmission, Helium), (*Liquefied gases, Sound transmission), Velocity, Entropy, Specific heat, Viscosity, Sound, Resonators, Resonance, Thermal radiation, High-pressure research, Temperature, Freezing, Test equipment, Propagation, Phase studies, USSR.

The propagation velocity of second sound was measured over the whole liquid helium II region at temperatures from 1.3K to the lambda-line. Curves were drawn for the transition of helium II to helium I and to solid helium. (Author)

AD-605 634 Div. 25
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INFRARED,
by Sidney Passman. 25 Oct 60, 16p P-2129

Unclassified report

Descriptors: (*Infrared radiation, Reviews), Infrared equipment, Atmosphere, Light transmission, Infrared optical systems, Infrared detectors, Light signals, Communication theory.

The following topics are reviewed: infrared sources; transmission of atmosphere and optical media; detection of IR radiation; IR signal processing and presentation.

AD-605 660 Div. 25, 8
OTS Prices: HC $2.00/MF $0.50

Hughes Aircraft Co., Fullerton, Calif.
ANALYSIS OF FAILURE MECHANISMS WITH HIGH-ENERGY RADIATION.
Quarterly rept. no. 2, 1 Apr-30 Jun 62,
by C. B. Schoch and V. R. Honnold. 1 Jul 62, 26p
Contract AF30 602 2596, Proj. 5519, Task 551902
RADC TDR62 428

Unclassified report

Descriptors: (*Semiconductors, Radiation damage), (*Semiconductor devices, Failure (Mechanics)), (*Dielectrics, Failure (Mechanics), Silicon, Germanium, Diodes (Semiconductor), Transistors, Surface properties, Degradation, Crystals, Gamma rays, Electric currents, Environmental tests, Nuclear magnetic resonance, Tantalum capacitors.

This program is being conducted to seek out and analyze some specific modes of failure in semiconductor materials, semiconductor devices, and dielectrics with the use of high-energy radiation. During this reporting period additional surveys were conducted to define more clearly specific problem areas with semiconductor devices and to direct the efforts of this program in order to derive maximum benefit from it. The experimental program on the effects of gamma radiation on germanium and silicon diodes was continued, and silicon PNP transistors were added to this program. A study on surface effects encountered with silicon devices was initiated; however, further analytical work with conventional means is required before nuclear methods can be applied effectively. Additional work in connection with failure mechanisms in dielectric materials has been explored, and further progress has been made in the development of a sensitive nuclear-magnetic resonance apparatus. (Author)

AD-605 705 Div. 25, 1, 9,
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NEWS OF ACADEMY OF SCIENCES USSR, TECHNOLOGY SECTION, MECHANICS AND MECHANICAL ENGINEERING, 1961, NO. 4: SELECTED ARTICLES,
by V. V. Babykin, Yu. M. Romanovskii, S. A. Ambartsumyan, Zh. E. Bagdasaryan, and G. V. Mishenkov. 27 Jan 64, 40p
FTD MT63 135; TT 64 71356

Unclassified report

Edited machine trans. of Akademiya Nauk SSSR. Izvestiya. Mekhanika i Mashinostroenie, 1961, no. 4, p. 83-103.

Descriptors: (*Mechanics, Reports), (*Wings, Flutter), (*Supersonic flow, Flat plate models), (*Panels (Structural), Oscillation), Aircraft, Ailerons, Friction, Atmospheric motion, Gusts, Oscillation, Models (Simulations), Mathematical analysis, Stability, Rectangular bodies, Gases, Stresses, Differential equations, Functions, Elasticity, Loading (Mechanics), Cylindrical bodies, USSR Structrual shells.

Contents: Nonlinear Flutter of Wing of Aircraft During Flight in Bumpy Air; Stability of Orthotropic plates Around Which Flows a Supersonic Flow of Gas; and Forced Nonlinear Oscillations of Elastic Panels.

AD-605 717 Div. 25, 13, 17
OTS Prices: HC $2.00/MF $0.50

Stanford Univ., Calif.
CREEP INDUCED INSTABILITY IN STRUCTURES.
Technical rept. no. 8,
by Robert L. Carlson. Jun 64, 32p SUDAER-198
Contract Nonr225 47, Proj. NR064 434

Unclassified report

Descriptors: (*Creep, Structures), (*Structures, Creep), Stresses, Mathematical analysis, Tensor analysis, Structural parts, Compressive properties, Strain (Mechanics), Loading (Mechanics), Stability, Flat plate models, Aluminum alloys, Beams, Deformation, Time.

A brief discussion of various formulations for analyzing creep effects in structures is presented, and detailed attention is directed toward problems involving creep induced instability. The theory of Robotnov and Shesterikov is discussed and it is noted that the application of their theory

Wright-Patterson AFB, Ohio.
INTERACTION OF PLASMOIDS WITH EXTERNAL MAGNETIC FIELDS,
by N. A. Khizhnyak and B. G. Safronov. 9 Mar 64, 48p
FTD MT64 32; TT 64 71330

Unclassified report

Edited machine trans. of mono. Fizika Plazmy i Problemy Upravlyaemogo Termoyadernogo Sinteza (Physics of Plasma and Problem of Controlled Thermonuclear Synthesis) Kiev, 1963, p. 238-275.

Descriptors: (*Plasma medium, Motion), (*Magnetic fields, Charged particles), Plasma physics, Electromagnetism, Magnetic moments, Equations, USSR.

An attempt is made to give a theoretical description of the interaction of plasmoids with external magnetic fields, considering the plasma nature of the plasmoid, its finite dimensions, and geometry. Equations of longitudinal motion, transverse compression and rotational motion are presented self-induction of the plasmoid and its conductance are calculated; questions of the interaction of plasmoids with fields of corklike configuration are discussed, as well as behavior of magnetic moment of the plasmoid. Conditions were found with which it is possible to use a model of flexible current winding. In the second part are studied conditions of plasmoid repulsion from the magnetic field and conditions of plasmoid capture; equations recorded are of stability for inductive plasmoid with general equations for its self-induction, the interaction of long plasmoids with external fields and collision of plasmoids. (Author)

AD-605 594 Div. 25, 4
OTS Prices: HC $2.00/MF $0.50

Connecticut Univ., Storrs.
ANGULAR DEPENDENCE OF DIFFERENTIAL CROSS SECTION FOR CHARGE TRANSFER IN He(+) on He COLLISIONS,
Final rept.,
by Edgar Everhart. 30 Apr 64, 29p
Contract AF19 628 2387, Proj. 7635,
AFCRL 64 148

Unclassified report

Descriptors: (*Helium, Electron capture), Ionization, Exchange reactions, Scattering, Particles, Atomic energy levels, Ionization potentials.

Differential measurements were made for the process He(+) + He yields He + He(+). The differential cross section for this charge transfer was determined at 12 kev, 6 kev, 3 kev, 1.5 kev, 0.75 kev and 0.44 kev. This quantity, in square centimeters, is plotted vs laboratory scattering angle in the range of 1 to 4 degrees. To obtain these results, the experimentally-measured electron capture probability was multiplied by a calculated value of the differential cross section for scattering of the fast particle. The interatomic potential energy function used in these calculations is one which was found experimentally to be in agreement with resonant electron capture data. (Author)

AD-605 600 Div. 25, 15
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON MAGNETOHYDRODYNAMIC EQUATIONS,
by R. V. Polovin and K. P. Cherkasov. 13 Mar 64, 29p
FTD MT64 27; TT 64 71337

Unclassified report

Edited machine trans. of mono. Fizika Plazmy i Problemy Upravlyaemogo Termoyadernogo Sintez (Physics of Plasma and Problem of Controlled Thermonuclear Synthesis) Kiev, 1963, p. 196-217.

Descriptors: (*Magnetohydrodynamics, Equations), (*Plasma medium, Motion), Plasma physics, Particles, Velocity, Numerical analysis, Matrix algebra, USSR.

AD-605 605 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRODYNAMIC ACCELERATION OF PLASMOIDS,
by I. T. Guzhovskii, A. F. Krivonos, and B. G. Safronov. 2 Mar 64, 11p
FTD MT64 28; TT 64 71342

Unclassified report

Edited machine trans. of mono. Fizika Plazmy i Problemy Upravlyaemogo Termoyadernogo Sinteza, Kiev [1963] p. 219-223.

Descriptors: (*Plasma medium, Sources), Plasma physics, Electric discharges, Batteries and components, Acceleration, Hydrogen, Ionization, Capacitor, Electrodes, Force (Mechanics), USSR.

A discussion is given of various sources of plasmoids.

AD-605 613 Div. 25, 4
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
TRIPLET-TRIPLET ABSORPTION IN SENSITIZED SOLVENT DECOMPOSITION,
by S. Siegel and K. Eisenthal. 22 May 64, 37p
TDR-269(4240-30)-7
Contract AF04 695 269
SSD TDR64 97

Unclassified report

Descriptors: (*Organic solvents, Decomposition), Atomic energy levels, Paramagnetic resonance, Excitation, Polycyclic compounds, Free radicals, Absorption, Energy, Sensitivity, Photons, Ethers, Molecules.

The decay of the steady-state EPR signal from naphthalene triplet-state molecules in ether and other glasses under continuous near-ultraviolet irradiation at 77K was examined in some detail. It was shown that free radicals are produced by sensitized solvent decomposition at the same rate as the disappearance of the triplet-state EPR signal. Also, it was demonstrated that the latter decay process has a first-order dependence upon naphthalene concentration and that it exhibits a dependence upon excitation intensity, which is consistent with a two-photon absorption mechanism. The experimental results are discussed in terms of a model that involves the resonant transfer of energy from a highly excited triplet state of naphthalene to the solvent. Excitation of the excited triplet state took place via the absorption of a photon by a naphthalene molecule in its lowest triplet state. The free radicals were produced by the decomposition of the sensitized solvent molecule. It is believed that the naphthalene molecule is not destroyed in this process but that the EPR signal decay arises from a radical-molecule inter-action which effectively shortens the lifetime of the triplet state. (Author)

AD-605 615 Div. 25, 9
OTS Prices: HC $2.00/MF $0.50

Jet Propulsion Center, Purdue Univ., Lafayette, Ind.

properties, Chemisorption, Light, Atomic energy levels, Zinc compounds, Oxides, USSR.

A theory is developed which is intended to permit the determination of the sign of the photoadsorptive effect (i.e., the change in adsorptivity of a surface with illumination), depending on the values of the parameters which characterize the nature of the adsorbant and adsorbate, the state of the system as a whole, and the mode of experiment.

AD-605 736 Div. 25
OTS Prices: HC $1.00/MF $0.50

Columbia Radiation Lab., New York.
THE OPTICAL MASER APPLIED TO BRILLOUIN SCATTERING SPECTROSCOPY.
Progress rept. no. 3, 1 Oct 63-31 Mar 64,
by R. Novick. Apr 64, 4p
Grants DA ARO D31 124G380, NSF GP438,
Proj. 009925001

Unclassified report

Descriptors: (*Lasers, Spectroscopy), (*Spectroscopy, Lasers), Interferometers, Brillouin zones, Diffusion, Scattering.

Measurements, of linewidth of Rayleigh scattering due to diffusion were completed. Small discrepancies between theory and experimental data were traced to Doppler shift effects produced by thermal convection in the solvent, and were subsequently eliminated. In an auxiliary experiment, this same Doppler effect was studied with the solvent current controlled mechanically. Results indicate that this effect can be used as a technique in fluid flow measurements.

AD-605 750 Div. 25
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
UNIFIED DYNAMICS AND THERMODYNAMICS OF A THERMAL PLASMA.
by H. Maecker and Th. Peters. 26 Jun 58, 40p T-90
TT 64 71351

Unclassified report

Trans. of Zeitschrift für Physik (West Germany) 1956, v. 144, p. 586-611.

Descriptors: (*Plasma physics, Thermodynamics), (*Dynamics, Plasma physics), Irreversible processes, Hydrodynamics, Energy, Continuum mechanics, Electrical conductance, Kinetic theory, Equations, Motion.

A. Schlüter and others have proposed a theory of plasma dynamics based on hydrodynamic principles in which the thermodynamics of the plasma are not considered. Therefore, this unified theory for the dynamics and thermodynamics of the plasma is presented using the principles of irreversible thermodynamics. Essentially, three flow equations result. The current and ambi-polar flow equations agree with Schlüter's equations except for the additional thermal forces. The third is the general energy flow equation which refers the energy flow to the center-of-mass flow, the current and ambi-polar flow and finally to thermal conduction (without flow). (Author)

AD-605 757 Div. 25
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SURPRISES OF NEAR-LIGHT SPEEDS: A DIALOGUE ON THE THEORY OF RELATIVITY,
by Yu. I. Sokolovskii. 28 Aug 64, 34p
FTD MT64 254; TT 64 71354

Unclassified report

Edited machine trans. of mono. Syurprizy Okolosvetovykh Skorostei: Dialog o Teorii Otnositel'nosti, Moscow, 1963, 23p.

Descriptors: (*Relativity theory, Reviews), Quantum mechanics, Light, Velocity, USSR.

AD-605 768 Div. 25
OTS Prices: HC $1.00/MF $0.50

Rice Univ., Houston, Tex.
OPTICAL SPECTRA AND MOLECULAR PARAMETERS OF LIGHT ELEMENT MOLECULES.
Progress rept. no. 4, 1 Jan-31 Mar 64,
by John L. Margrave. 31 Mar 64, 4p
Contract DA31 124AROD91, Proj. ARPA Order 40, Task 5

Unclassified report

Descriptors: (*Spectroscopy, Molecules), Molecular spectroscopy, Ultraviolet spectroscopy, Infrared spectroscopy, Spectra (Visible and ultraviolet), Discharge tubes, Thermodynamics, Excitation, Halides.

AD-605 769 Div. 25
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
MOLLIER ENTHALPY-ENTROPY CHARTS FOR HIGH-TEMPERATURE PLASMAS,
by F. Bosnjakovic, W. Springe, K. F. Knoche, and P. Burgholte. 25 Aug 58, 28p T-96
TT 64 71349

Unclassified report

Trans. of mono. Paper presented at the ASME Symposium on Thermal Properties, Purdue Univ., 23-26 Feb 59.

Descriptors: (*Heat transfer, Plasma physics), (*Plasma physics, High temperature research), Graphics, Enthalpy, Entropy, Pressure, Stagnation point, Vapors, Temperature, Dissociation, Gas ionization, Hydrogen, Argon, West Germany.

Energy changes and heat transfer in high-temperature gaseous plasma flows are becoming increasingly important in technology. Mollier enthalpy-entropy diagrams have proved to be valuable tools in this development. Enthalpy-entropy diagrams for hydrogen and argon plasmas at temperatures up to 100,000K and for pressures from 0.01 to 100 atm are presented. The diagrams are shown with lines of constant pressure, density, temperature, and sonic velocity. These graphs are further plotted in logarithmic co-ordinates in order to present the low-temperature region more clearly. The diagrams are only valid for plasmas existing in thin layers where the energy and entropy content of the enclosed radiation is not important. Radiation must be taken into account for plasma layers of large thickness. As an example of the application of these charts, the stagnation temperature of a body flying at 8,000 meters/sec in a hydrogen or argon atmosphere at 0.01 atm pressure and 300K temperature is calculated. For the case of a hydrogen atmosphere, the wall temperature at the stagnation point T sub w = 2000K (wall radiation neglected) and T sub w = 1820K (with wall radiation). In argon, these values are 16,500K without and 5800K with wall radiation. The great importance of both the medium and the wall radiation is apparent. In these calculations it is assumed that no magnetic field exists. (Author)

should be restricted to time intervals during which the change in average strain is small. An alternative formulation which is not subject to this restriction is proposed, and it is applied to the problem of a compressively loaded column and to the problem of a compressively loaded plate. An application of the proposed analysis to available column creep results is made and a good correlation with data is obtained. (Author)

AD-605 719 Div. 25
OTS Prices: HC $1.00/MF $0.50

Weizmann Inst., Rehovoth (Israel).
ANGULAR VARIATION OF COERCIVITY IN ORTHOFERRITE SINGLE CRYSTALS.
Technical note no. 6,
by S. Reich, S. Shtrikman, and D. Treves.
1 Aug 64, 24p
Contract AF61 052 654

Unclassified report

Descriptors: (*Ferrites, Single crystals), (*Single crystals, Ferrites), Crystal structure, Crystallography, Ferromagnetic materials, Israel.

The coercive force Hc as a function of the angle between the easy axis of magnetization and the external field was studied in orthoferrite single crystals using the vibrating sample technique. (Author)

AD-605 720 Div. 25
OTS Prices: HC $1.00/MF $0.50

Weizmann Inst., Rehovoth (Israel).
NONLINEARITY OF THE SUSCEPTIBILITY IN WEAK FERROMAGNETS AND ANTIFERROMAGNETS.
Technical note no. 7,
by S. Shtrikman and D. Treves. 1 Aug 64, 7p
Contract AF61 052 654

Unclassified report

Descriptors: (*Ferromagnetic materials, Nonlinear systems), (*Antiferromagnetism, Nonlinear systems), Tensor analysis, Crystal structure, Anisotropy, Symmetry (Crystallography), Molecular properties, Fluorides, Iron compounds, Cobalt compounds, Israel.

The symmetry of the tensor describing the quadratic dependence of the magnetization on an applied field is studied for the various magnetic point groups. It is described by at most one parameter in antiferromagnetic materials, and up to ten in ferromagnetic materials. This parameter is calculated from basic principles to various approximations for FeF2 and CoF2. (Author)

AD-605 721 Div. 25
OTS Prices: HC $1.00/MF $0.50

Weizmann Inst., Rehovoth (Israel).
SPONTANEOUS MAGNETIZATION IN ORTHOFERRITES BETWEEN LIQUID AIR TEMPERATURE AND THE CURIE POINT.
Technical note no. 8,
by G. Gorodetsky and D. Treves. 10 Aug 64, 16p
Contract AF61 052 654

Unclassified report

Descriptors: (*Ferrites, Magnetic properties), (*Ferromagnetism, Moments), Air, Liquefied gases, Temperature, Iron, Crystal lattices, Rare earth elements, Ions, Single crystals, Paramagnetic materials, Israel.

Results of measurements of the ferromagnetic moment of rare earth orthoferrites between 90K and the Curie point are presented. These results show that the rare earth ions behave like a paramagnet in an effective field due to the iron ions. (Author)

AD-605 722 Div. 25
OTS Prices: HC $1.00/MF $0.50

Weizmann Inst., Rehovoth (Israel).
WEAK FERROMAGNETIC GAUSSMETER.
Technical note no. 9,
by S. Shtrikman and D. Treves. 20 Aug 64, 10p
Contract AF61 052 654

Unclassified report

Descriptors: (*Magnetometers, Design), (*Ferromagnetic materials, Magnetometers), Magnetic fields, Torque, Measurement, Instrumentation, Garnet, Single crystals, Symmetry (Crystallography), Israel.

A torque magnetometer G.E. type gaussmeter using weak ferromagnetic rotors is described. Such an instrument gives a reading essentially linear with fields up to 100,000 gauss. The actual torques are higher than those obtained with para-or diamagnetic rotors, even at 100,000 gauss. An experimental instrument was built, and found to yield a linear reading up to the highest field available i.e. 25 Kgauss. (Author)

AD-605 730 Div. 25
OTS Prices: HC $2.00/MF $0.50

National Co., Inc., Malden, Mass.
STUDIES IN EXCHANGE INTERACTIONS TO PRODUCE POPULATION INVERSIONS IN LASER MATERIALS.
Final rept.,
by George W. Meyers, Raoul M. Freyre, William T. Kwo, and Eugene C. LaVier. 20 Mar 64, 48p
Contract AF19 628 2481, Proj. 4645, Task 464502
AFCRL 64 261

Unclassified report

Descriptors: (*Lasers, Materials), (*Erbium compounds, Chlorides), (*Praseodymium compounds, Chlorides), Ions, Atomic energy levels, Crystal lattices, Impurities, Selection rules, Electric moments, Magnetic moments, Spectroscopy.

The pure chlorides of praseodymium and erbium, and mixtures, were investigated with regard to those properties significant in laser application. Cooperative ion absorptions were examined in PrCl3 and the cross section determined for the (3)P0 + (3)F2 level. Lifetime of the (3)P0 state in PrCl3 was determined. ErCl3 as well as Er(3+) in a PrCl3 lattice was examined for coupled interactions. (Author)

AD-605 733 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THEORY OF PHOTOADSORPTIVE EFFECT IN SEMICONDUCTORS,
by F. F. Vol'kenstein and I. V. Karpenko. 27 Aug 64, 20p
FTD MT64 205; TT 64 71359

Unclassified report

Edited machine trans. of mono. Poverkhnostnye Svoistva Poluprovodnikov (Surface Properties of Semiconductors) Moscow, 1962, p. 114-127.

Descriptors: (*Semiconductors, Adsorption), Surface

related to the mode coupling problem. Various biasing schemes were employed to circumbent mode locking. A theoretical analysis of mode coupling effects in a linear cold cavity was accomplished using the analogy of a closed-loop twin-line with a lumped shunt susceptance. In addition, a general theoretical treatment of optical resonators resulted in a graphical technique, which considerably simplifies the design and analysis of any specific ring laser system. (Author)

AD-605 827 Div. 25
OTS Prices: HC $4.00/MF $1.00

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
NON-EQUILIBRIUM RADIATION,
by John L. Kulander. Jun 64, 136p R64SD41
Unclassified report

Descriptors: (*Plasma medium, Thermodynamics), Gases, Atomic energy levels, Resonance absorption, Electron density, Relaxation time, Absorption spectrum, Excitation, Statistical functions, Tables.

The criteria specifying the conditions for which a gas will be in a state of local thermodynamic equilibrium are discussed for both collisionally and radiatively controlled transition processes. Particular emphasis is given to the radiation field in a gas where the particle translational distribution functions are Maxwellian. A microscopic formulation of the transfer equation and solution for the source function is presented for a general n level atom where the first resonance line is optically non-thin. Specific solutions are given for a 3-level atomic model. The calculation of the radiative and collisional cross-sections and transition rates is discussed. The bound-bound and bound-free rates are calculated for the lower lying states of N I-VII assuming equilibrium distribution functions for temperatures between 10,000 and 1,000,000K. The electron densities and temperatures for which the various collisional and radiative rates are balanced are presented as an indication of situations where the gas (N) will not be in a state of local thermodynamic equilibrium. (Author)

AD-605 829 Div. 25, 17
OTS Prices: HC $2.00/MF $0.50

Raytheon Co., Waltham, Mass.
SINGLE CRYSTAL HEXAGONAL FERRITES.
Quarterly progress rept no. 4, 15 Jan-31 May 64,
by J. Van Hook and S. Cvikevich. 31 May 64, 38p
Ray-S-658
Contract DA36 039AMC00096E, Proj. 1G6 22001A057
Unclassified report

Descriptors: (*Single crystals, Ferroelectric materials) (*Ferroelectric crystals, Single crystals), (*Zinc alloys, Yttrium alloys), (*Yttrium alloys, Zinc alloys), (*Crystal growth, Ferroelectric crystals), Crystals, Crystal structure, Additives, Manganese compounds, Oxides, Barium compounds, Borates, Melting, Chemical analysis, Magnetic properties, Crystal lattices, Resonance, Spheres, Superhigh frequency.

Single crystals of ZnY and ZnY with additions of MnO_2 have been grown from barium borate melts. Chemical composition, saturation magnetization, lattice parameter, and resonance linewidth were measured on single and polycrystalline samples of these materials. Substitution of manganese materially improves the resonance linewidth of ZnY. Typical linewidth values at 9.2 Gc for spheres of pure ZnY were 50 Oe, whereas corresponding values on ZnY crystals containing manganese, produced under identical conditions, were of the order of 10 Oe. (Author)

AD-605 847 Div. 25
OTS Prices: HC $1.00/MF $0.50

Oregon Univ., Eugene.
MAGNETIC BREAK-DOWN IN SOLIDS.
Technical rept. no. 4,
by U. N. Upadhyaya. 1964, 11p
Contract Nonr2771 05, Proj. NR017 633
Unclassified report

Descriptors: (*Magnetic materials, Atomic orbitals), Solids, Magnetic fields, Field theory, Vector analysis.

The report rederives the criteria for the magnetic breakdown in solids using a different approach from that followed by earlier authors. As the approach does not use any perturbation theory, the result is valid for all strengths of magnetic field. (Author)

AD-605 850 Div. 25
OTS Prices: HC $1.00/MF $0.50

Midwest Research Inst., Kansas City, Mo.
THE STRUCTURE AND STRENGTH OF EPITAXIAL FILMS.
Bimonthly progress rept. no. 5, 17 Jun-17 Aug 64,
by Melvin Lavik, Paul Stablein, and Paul J. Bryant.
25 Sep 64, 8p
Contract NOw64 0061d, Proj. 2742P
Unclassified report

Descriptors: (*Films, Epitaxial growth), (*Epitaxial growth, Films), (*Gold, Metal films), (*Metal films, Gold), Tensile properties, Vacuum apparatus, Vapor plating, Laboratory furnaces, Strain (Mechanics), Test equipment, Stresses.

The main effort during this report period has been the design of a tensile device to facilitate stress-strain measurements on free epitaxial films and the development of techniques for removing the substrate from such films. In addition, the evaporation oven has been rebuilt so that only the inner wall of the crucible is exposed to UHV. Lower operating pressures may now be maintained during evaporation. Gold films have been deposited on aluminum, silver, NaCl, and mica crystals and their structure is being studied. (Author)

AD-605 851 Div. 25, 17
OTS Prices: HC $3.00/MF $0.50

Midwest Research Inst., Kansas City, Mo.
A STUDY OF THE EFFECT OF SURFACE FILMS ON FATIGUE FRACTURE.
Annual summary rept. for 15 Aug 63-14 Aug 64,
by J. C. Grosskreutz and C. Quinton Bowles.
18 Sep 64, 52p
Contract Nonr3908 00, Proj. RA14P
Unclassified report

Descriptors: (*Films, Crystal lattice defects), (*Fracture (Mechanics), Crystallography), (*Crystallography, Surface properties), (*Aluminum, Fatigue (Mechanics)), (*Gold, Fatigue (Mechanics)), Crystals, Single crystals, Deformation, Strain (Mechanics), Fatigue (Mechanics), Hardness, Microstructure, Vacuum apparatus, Oxides.

The complete absence of a corrosive atmosphere during the deformation of aluminum leads to a postponement of the formation of slip bands in which fatigue cracks are known to initiate. This phenomenon can be explained on the basis of a lack of dislocation pinning at the surface due to oxidation processes. Surface anodic layers suppress surface slip in proportion to their thickness. Although

AD-605 795 Div. 25
OTS Prices: HC $3.00/MF $0.75

Raytheon Co., Waltham, Mass.
FAILURE MECHANISMS IN FERROELECTRIC AND NON-LINEAR DIELECTRICS.
Final technical rept.,
by H. H. Barrett, P. B. Nutter, A. Paladino, and J. S. Waugh.
May 63, 94p Ray S-543
Contract AF30 602 2678, Proj. 5519, Task 551902
RADC TDR63 238; N63 19329
Unclassified report

Descriptors: (*Ferroelectric materials, Failure (Mechanics)), (*Dielectrics, Electrical properties), (*Strontium compound, Titanates), (*Titanates, Strontium compounds), Ferroelectric crystals, Strontium compounds, Titanates, Single crystals, Dielectric properties, Oxidation, Crystal structure, Oxygen, Electrostriction, Electric discharges, Diffusion.

Breakdown fields in single-crystal SrTiO3 have been measured over a temperature range of -195C to 100C and the results are compared with the predictions of Frohlich's theory. Measurements are consistent with the theory on magnitude and temperature dependence of breakdown field except at the lower temperatures where the disturbing effects of electrostrictive strain are considerable. A marked variation of dielectric and resistive properties of SrTiO3 samples is observed to be dependent upon the sample's history and a qualitative explanation of the effect is proposed. Bulk diffusion constants in annealed and unannealed SrTiO3 have been measured directly. The diffusivity is found to be dependent upon dislocation density but is several orders of magnitude too low to explain the rapid oxidation rates observed in SrTiO3. Alternative explanations of this discrepancy are put forward. (Author)

AD-605 803 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THERMODYNAMIC PROPERTIES OF ARGON AT HIGH TEMPERATURES,
by V. V. Rybakov. 27 Aug 64, 8p
FTD TT64 461; TT 64 71380
Unclassified report

Unedited rough draft trans. of Izvestiya Uchebnykh Zavedenii. Neft' i Gaz (USSR) 1963, v. 6, no. 5, p. 77-80.

Descriptors: (*Thermodynamics, Argon), (*Argon, Thermodynamics), High-temperature research, Ionization, Enthalpy, Entropy, Equations of state, Statistical mechanics, USSR.

AD-605 811 Div. 25
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
ION DISSOCIATION IN THE DRIFT TUBE OF A TIME-OF-FLIGHT MASS SPECTROMETER: III. FLIGHT-TIME SHIFT EQUATIONS FOR SPURIOUS FRAGMENT PEAKS ARISING FROM HARGE TRANSFER AND DISSOCIATION REACTIONS OCCURRING INSIDE THE POTENTIAL BARRIER,
by W. W. Hunt, Jr. Jun 64, 16p
Proj. 7635
AFCRL 64 519; AFCRL PSRP30
Unclassified report

Descriptors: (*Ions, Dissociation), (*Mass spectroscopy, Spectrum analyzers), (*Differential equations, Mass spectroscopy), Charge particles, Particle beams, Potential theory, Time, Reaction kinetics, Equations.

Spurious fragment peaks that simulate fragment-ion products of ion dissociation reactions occurring in the reaction region can arise from processes that occur after the reactant ion has passed through the reaction region and entered the potential barrier used to separate normal products and reactants. Analytic expressions for the flight-time shifts characteristics of peaks arising in this way are derived. These flight-time shifts depend on the distance from the ion source to the potential barrier, whereas flight-time shifts for true fragments formed in the reaction zone are independent of this distance. (Author)

AD-605 814 Div. 25, 4
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
OBSERVATION OF 2,1 CHARGE TRANSFER IN A TOF MASS SPECTROMETER,
by W. W. Hunt, Jr. and K. E. McGee. Jul 64, 13p
Proj. 8605
AFCRL 64 591; AFCRL PSRP39
Unclassified report

Paper presented at the Southwestern Meeting of the American Physical Society at Tucson, Ariz., 28 Feb 64.

Descriptors: (*Mass spectroscopy, Exchange reactions), (*Nitrogen compounds, Oxides), Gas ionization, Dissociation, Atomic charge, Spectrum analyzers, Design, Electron beams.

The drift tube of a time-of-flight mass spectrometer has been adapted to serve as a reaction/collision chamber for studying ion dissociation reactions and charge-changing collisions. The methods for identifying the products of such processes depend on shifts in flight times produced by symmetric potential barriers, and are normally used in studying processes in which the mass-to-charge ratio (m/q) of the charged product particle is less than that of its parent. Processes in which the m/q of a charged product is greater than that of its parent represent an interesting special case, since the behavior of the product particle is quite different from that normally encountered. To illustrate this behavior, experimental observations of the 2, 1 charge transfer process N2(++) + N2O = N2(+) + N2O(+) at 6000 ev are presented. (Author)

AD-605 818 Div. 25, 19
OTS Prices: HC $4.00/MF $0.75

Sperry Gyroscope Co., Great Neck, N. Y.
ELECTROMAGNETIC ANGULAR ROTATION SENSING.
Final rept. for 1 Jun 63-15 Apr 64,
by W. Macek, R. Salamon and D. Davis. Aug 64,
120p AB-1272-0011
Contract AF33 657 11433, Proj. 4427, Task 442704
AL TDR64 210
Unclassified report

See also AD-431 654.

Descriptors: (*Celestial guidance, Lasers), (*Lasers, Instrumentation), Rotation, Gyroscopes, Electromagnetic waves, Mirrors, Neon, Helium, Optical properties.

Studies were conducted on adapting the Sperry traveling-wave ring laser for rotation sensing. Various optical combiners were evaluated to minimize coupling between the oppositely directed waves while maximizing S/N ratios and permitting the sense of rotation to be determined without recourse to biasing. Coupling effects due to dust particles and mirror surface imperfections were also considered in relation to their effects on mode locking. A region of nonlinear oscillation just prior to frequency pulling and locking, at low rotation rates, was clearly established and

(*Mechanical engineering, Loading (Mechanics)), Mathematical analysis, Stresses, Periodic variations, USSR, Structural parts, Loading (Mechanics).

This work considers the problem of determining structure durability during asymmetric cycle of simple and complex forms of continuous, and also discrete, random stresses. The general formulas of durability are obtained on the basis of linear and nonlinear theories of accumulation of fatigue damage. The extremeness of the linear law of fatique damage accumulation is established. The upper and lower limits of the durability ratio, calculated by nonlinear and linear theories of fatigue accumulation are found for the general case of load.

AD-605 885 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CONCERNING COMBINED LOADING OF A MATERIAL DURING BUCKLING OF SHELLS IN A PLASTIC AREA,
by G. Teters. 11 May 64, 12p
FTD MT63 267; TT 64 71409
Unclassified report

Edited machine trans. of Akademiya Nauk Latviiskoi SSR, Riga. Izvestiya, 1963, no. 5(190) p. 45-50.

Descriptors: (*Buckling (Mechanics), Structural shells), (*Loading (Mechanics), Structural shells), (*Structural shells, Loading (Mechanics)), Stability, Elasticity, Stresses, Plasticity, Deformation, Cylindrical bodies, Equations.

For an approximation to the actual work of a material in a shell upon loss of stability in the plastic area, when the material works under the conditions of 'combined loading', the stability of shells was investigated on the basis of the theory of locality of deformations, which in principle solved the problem of combined loading. Theoretical dependences of deformation of the material are compared with experimental data, which are well coordinated with theoretical curves. An expression of critical stress was obtained for a long circular cylindrical shell, compressed along generatrices with an axially symmetric form of buckling. (Author)

AD-605 894 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE OBTAINING OF, AND CERTAIN PROPERTIES OF FILIFORM AND ACICULAR SINGLE CRYSTALS OF GERMANIUM AND SILICON, AND THEIR SOLID SOLUTIONS,
by A. V. Sandulova, P. S. Bogoyavlenskii, and M. I. Dronyuk. 28 May 64, 16p
FTD MT64 44; TT 64 71415
Unclassified report

Edited machine trans. of Fizika Tverdogo Tela (USSR) 1963, v. 5, no. 9, p. 2580-2586.

Descriptors: (*Germanium, Single crystals), (*Silicon, Single crystals), Crystal growth, Crystal structure, Crystallization, Mechanical properties, Solid solutions, Gases, Filaments, USSR.

A new method is proposed of obtaining filiform and acicular single crystals of germanium and silicon and their solid solutions, based on crystallizations from gas phase with the help of component-solvent. This method makes it possible to grow so-called single crystals having various forms, lengths, and sections and possessing great mechanical durability and a sufficient degree of homogeneity and perfection of structure. (Author)

AD-605 895 Div. 25, 17
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVESTIGATION OF SUPERCONDUCTING ALLOYS IN THE SYSTEM Nb--Zr,
by Z. A. Guts, N. M. Reinov, N. I. Krivko, T. A. Sidorova, and A. A. Fogel'. 2 Jan 64, 12p
FTD MT63 150; TT 64 71416
Unclassified report

Edited machine trans. of Fizika Tverdogo Tela (USSR) 1963, v. 5, no. 1, p. 361-362.

Descriptors: (*Niobium alloys, Superconductivity), (*Zirconium alloys, Superconductivity), (*Superconductors, Alloys), Magnetic fields, Ductility, Phase studies, Heat treatment, Hardness, USSR.

An investigation was made to determine the region in the system Nb--Zr where superconductivity takes place in strong (to 30,000 oe) magnetic fields, and the development of technology of obtaining the purest and most ductile alloys.

AD-605 901 Div. 25
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INTERACTION OF BEAMS OF CHARGED PARTICLES WITH PLASMA,
by Ya. B. Fainberg. 2 Mar 64, 46p
FTD MT64 26; TT 64 71422
Unclassified report

Edited machine trans. of mono. Konferentsiya po Fizika Plazmy i Probleme Upravlyaemogo Termoyadernogo Sinteza (Conference on Plasma Physics and Problems of Controlled Thermonuclear Synthesis) (no. 2) Kharkov, 1960. Doklady, Kiev, 1963, p. 88-117.

Descriptors: (*Charged particles, Plasma physics), (*Plasma oscillations, Particle beams), (*Particle beams, Plasma oscillations), Electron beams, Ion beams, Cerenkov radiation, Magnetic fields, Doppler effect, Waveguides, Gas discharges, Thermonuclear reactions, Particle accelerators, Reviews, USSR.

A review is given of recent studies concerning interactions of charged particle beams with plasmas in the following groups of cases: instabilities caused by the Vavilov-Cerenkov effect during the interaction of electronic and ion beams with plasma which is in a magnetic field; instability caused by the anomalous and by the normal Doppler effect; interactions involving confined plasmas.

AD-605 907 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
APPLICATION OF MICROWAVE METHODS TO INVESTIGATION OF DIELECTRIC PROPERTIES OF CERTAIN QUASILIQUID CRYSTALS,
by F. M. Gol'tsman. 10 Mar 64, 18p
FTD MT63 217; TT 64 71384 Unclassified report

slip may not be observed on the top of thick anodic layers, some slip can still occur at the metal-oxide interface. The amorphous nature of the anodic layer evidently prevents transmission of this step through a thick coating. Debris in the nature of dislocation loops is associated with surface slip lines, the debris being of higher density in gold than in aluminum. The difference is presumably due to a lower activation energy for climb in aluminum. The formation of the slip step results in a lattice strain surrounding the step. This strain occurs regardless of the presence of an oxide layer. This strain may be the cause of slip-step height saturation. (Author)

AD-605 865 Div. 25, 13, 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
APPLICATION OF METHOD OF CONSECUTIVE APPROXIMATIONS TO PROBLEMS OF STABILITY AND OSCILLATIONS OF ELASTIC SYSTEMS,
by V. E. Popovich. 26 May 64, 18p
FTD MT63 291; TT 64 71391
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Aviatsionnaya Tekhnika (USSR) 1962, v. 5, no. 4, p. 103-110.

Descriptors: (*Iterative methods, Mechanics), (*Numerical methods and procedures, Mechanics), Stability, Oscillation, Elasticity, Structures, Differential equations, Numerical analysis, USSR.

An approximate method of reduction of problem of the eigenvalues of differential equations with variable coefficients to an algebraic equation relative to the unknown parameter is presented. This method is distinguished from many methods of approximations by the fact that, first, it can be applied completely formally, i.e., without connection with preliminary approximation on unknown functions. Secondly, it reduces problem to an algebraic equation, allowing to determine whole spectrum of eigenvalues with any required accuracy. Third, it gives a solution with bilateral estimate that allows the accuracy of the result obtained to be judged. The given method differs from the method of successive approximations further by the fact that in the process of each consecutive approximation it is not necessary to satisfy boundary conditions, which are satisfied only once for general solution, built on definite rules of differential equation. The described method can be used to solve a number of complicated problems of structural mechanics.

AD-605 867 Div. 25, 4
OTS Prices: HC $1.00/MF $0.50

Bologna Univ. (Italy).
RESEARCH INTO THE CHEMICAL BEHAVIOUR OF SURFACE OF SINGLE-AND BI-CRYSTALS UNDER DIFFERENT EXPERIMENTAL CONDITIONS.
Quarterly technical status rept. no. 2, 1 May-30 Jul 64,
by Paolo Spinedi. 30 Jul 64, 14p
Contract DA91 591EUC3202 452 0040
Unclassified report

Descriptors: (*Zinc, Crystallography), (*Single crystals, Surface properties), (*Etched crystals, Preparation), Organic sulfur compounds, Sublimation, Vapor plating, Nucleation, Chemical properties, Electrochemistry, Italy.

Emphasis given to some results of decoration tests carried out with organic substances, and to the chemical and electrochemical behaviour of zinc tri-crystal surfaces towards an adequately moderated etchant. (Author)

AD-605 870 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE OPERATION OF A FOUR-LEVEL OPTICAL QUANTUM GENERATOR,
by Yu. A. Anan'ev, V. F. Egorov, A. A. Mak, D. S. Prilezhaev, and B. M. Sedov. 3 Feb 64, 12p
FTD MT63 229; TT 64 71394
Unclassified report

Edited machine trans. of Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (USSR) 1963, v. 44, no. 6, p. 1884-1888.

Descriptors: (*Lasers, Operation), Optical equipment, Quantum mechanics, Resonators, Pumping (Electronics), Calcium compounds, Fluorides, Impurities, Uranium, Samarium, USSR.

A theoretical and experimental investigation was made of the properties of a four-level optical quantum generator. Conditions were found for the transition from four-level to three-level generation in a generator on a CaF2:U(3+) base. (Author)

AD-605 879 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DEFINITION OF LOWER CRITICAL LOADS DURING LOCAL LOSS OF STABILITY OF THIN SHELLS,
by A. V. Sachenkov. 25 May 64, 22p
FTD MT63 292; TT 64 71403
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Aviatsionnaya Tekhnika (USSR) 1962, v. 5, no. 4, p. 111-122.

Descriptors: (*Loading (Mechanics), Structural shells), (*Structural shells, Loading (Mechanics)), Cylindrical bodies, Conical bodies, Spheres, Ellipsoids, Stability, Stresses, Anisotropy, Elasticity, Equations.

Formulas are derived, which determine lower critical loads for: (a) cylindrical shell under action of axial compression; (b) conical shell, compressed by force along the generatrices; (c) spherical shell and spheroid under action of uniform external pressure; and (d) oblate ellipsoid under internal pressure.

AD-605 882 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THEORY OF THE ACCUMULATION OF FATIGUE DAMAGE DURING AN ASYMMETRICAL CYCLE OF RANDOM STRESSES,
by V. F. Shukailo. 26 Dec 63, 22p
FTD MT63 115; TT 64 71406
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Mashinostroenie (USSR) 1962, no. 12, p. 21-32.

Descriptors: (*Fatigue (Mechanics), Theory),

polar cylindrical coordinates are applied to calculate the natural circular frequencies and mode shapes for the free, transverse vibrations of a solid elastic mass in an infinitely long, rigid, circular-cylindrical tank. (Author)

AD-605 937 Div. 25, 12
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
AN INVESTIGATION OF THE EFFECT OF INTERNAL OR EXTERNAL PRESSURE ON THE BENDING CHARACTERISTICS OF AN ACTUATOR SYSTEM UTILIZING A BELLOWS,
by Paul Seide. 31 Dec 58, 80p
STL-GM-TR-0165-00530, STL-EM-8-25
Unclassified report

Descriptors: (*Actuators, Buckling (Mechanics)), (*Cantilever beams, Actuators), Pressure, Deflection, Cylindrical bodies, Loading (Mechanics), Elasticity, Stability, Mathematical analysis, Experimental data.

The effect of internal or external pressure on the bending of a cantilevered bellows, the movable end of which is permitted only to rotate about a fixed point on the longitudinal axis of the beam, is investigated. It is found that the bending characteristics of the system vary considerably with changes in pressure and pivot location and that instability of the system may occur. The experimental results given tend to confirm the behavior predicted by the theory. (Author)

AD-605 940 Div. 25
OTS Prices: HC $3.00/MF $0.75

United Aircraft Corp., East Hartford, Conn.
ULTRASONIC CONTROL OF LASER PERFORMANCE.
Final rept. for 26 Jun 63-25 Jun 64,
by A. J. DeMaria and G. E. Danielson, Jr. 25 Sep 64, 66p UNAIR-C-920083-12
Contract DA19 020AMC0170A, Proj. IG6 22001A056 03 17
Unclassified report

Descriptors: (*Modulation, Lasers), (*Lasers, Control), (*Ultrasonic radiation, Lasers), Glass, Impurities, Neodymium, Refractive index, Mechanical waves, Feedback, Tunneling (Electronics), Standing wave ratios, Performance (Engineering).

The report describes the work performed on a research program directed toward determining the oscillation characteristics of a laser when the refractive index within the feedback cavity is perturbed by means of acoustic, electric, or magnetic fields. The laser is represented in terms of a system block diagram having forward and feedback transfer functions which can be varied in a periodic manner so as to modulate the output of the quantum device. The modification of a laser's feedback transfer function by an ultrasonic-refraction and by an optical-tunneling shutter has been utilized to gate the laser's output. Experiments are reported which demonstrate that the periodic fluctuation of the refractive index resulting from the propagation of focused ultrasonic energy within a solid state laser medium can be utilized as a Q-spoiler to gate the output of high gain lasers without the introduction of lossy elements into the laser's feedback path. In addition, experiments are reported which reveal an increase in the energy output of a neodymium doped Lanthanum Thorium Borate glass rod when longitudinal acoustical standing waves were propagated down the length of the glass rod. (Author)

AD-605 943 Div. 25, 20
OTS Prices: HC $1.00/MF $0.50

Michigan Univ., Ann Arbor. Coll. of Literature, Science, and the Arts.
THE RANDOM OPTICS OF PARTICLE BEAMS.
Technical rept. no. 15,
by Lawrence W. Jones. May 64, 16p ORA-03106-15-T
Contract Nonr1224 23, Proj. 03106
NP 14112
Unclassified report

Descriptors: (*Particle beams, Optics), Charged particles, Proton beams, Nuclear scattering, Electrons, Muons, Gamma rays, Neutron beams, Compton scattering, Neutrinos, Films, Images, Intensity, Deflection, Lenses.

Multiple Coulomb Scattering, which is generally regarded as an undesirable dirt effect in high energy physics, can be used to focus or deflect beams of energetic particles. For example, a parallel beam of protons passing through a 'lens' of lead, made so that the path length in lead increases as the off-axis distance squared will produce a focal spot of two or more times the intensity of the beam in the absence of the lens. Other configurations of scattering material can produce a net deflection of the beam. By using a high Z material and high energy beams (> 1 Gev) multiple scattering effects become relatively more important than energy loss or nuclear interactions. The application of these ideas to handling beams of muons and electrons is also explored. Corresponding effects such as Compton scattering and nuclear diffraction scattering may be used to 'focus' gamma-ray and neutron beams. (Author)

AD-605 951 Div. 25, 9
OTS Prices: HC $3.00/MF $0.50

Stanford Univ., Calif.
CONVECTION HEAT TRANSFER COEFFICIENTS IN DE LAVAL NOZZLES.
Technical rept. no. HS-3,
by R. K. Pefley. 1 Oct 51, 56p
Contract N6onr251 06, Proj. NR090 104
PB 154 294
Unclassified report

Descriptors: (*Laval nozzles, Heat transfer coefficients), (*Heat transfer coefficients, Laval nozzles), Heat transfer, Rocket motor nozzles, Two-dimensional flow, Test methods, Pressure, Differential equations, Flat plate models, Boundary layer, Mathematical prediction, Experimental data.

The objectives of this program are to determine the local convection heat transfer coefficients in the convergent portion and throat sections of de Laval nozzles; and to determine the effect on the local heat transfer coefficients, particularly at the throat, of varying the contour in the converging section of the nozzle. Three two-dimensional nozzles have been tested. Heat transfer coefficients have been obtained for both the flat and contoured walls.

AD-605 953 Div. 25, 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ON THE RESPONSE OF A LAYERED HALF-SPACE TO A MOVING LOAD,
by John W. Miles. 29 Jan 59, 12p
STL/TN-59-0000-00227, STL-EM-9-2
Unclassified report

Descriptors: (*Acoustics, Fluids), (*Mechanical waves, Propagation), Boundary value problems, Shock waves, Fourier analysis, Fluid mechanics.

The response of a two-layered, fluid half-space to a concentrated line-load moving over its free surface with uniform velocity is determined. Three cases are distinguished,

Edited machine trans. of Leningrad Univ. Vestnik (USSR) 1953, v. 8, no. 5, p. 73-81.

Descriptors: (*Crystals, Dielectric properties), Dielectrics, Waveguides, Measurement, Microwave frequency, Microwaves, Solutions, Molecules, USSR, Liquids, Test methods.

An attempt was made to process and to develop existing waveguide methods of measurements of dielectric constants in the microwave range, in order to make them as suitable as possible for temperature investigations. The developed methodology was applied to a study of dielectric properties of certain quasi-liquid crystals and their solution.

AD-605 911 Div. 25
OTS Prices: HC $4.00/MF $0.75

Stanford Electronics Labs., Stanford Univ., Calif.
ELECTRON MICROPROBE STUDY OF LATTICE-POINT DEFECTS IN SEMICONDUCTOR SINGLE CRYSTALS,
by H. R. Potts. Jul 64, 115p
SEL 64-075, SEL TR-5106-2
Contract DA31 124ARO D15[illegible]

Unclassified report

Descriptors: (*Semiconductors, Single crystals), (*Single crystals, Semiconductors), X-ray diffraction analysis, Crystal structure, Crystal lattice defects, Heat treatment, Heat of activation, Thermodynamics, Vapor pressure, Diffusion, Gallium compounds, Arsenides, Germanium, Probes (Electromagnetic), Gallium alloys, Arsenic alloys.

The four goals in this study were: To develop a method for making precise measurements of lattice constants in semiconductor crystals utilizing the electron microprobe and the Kossel-line technique. To determine the thermal-equilibrium concentration of lattice-point defects in semiconductor crystals, particularly GaAs. To study the annealing characteristics of the defects. To determine the effects of subjecting the semiconductors to an As vapor pressure in excess of that found at thermal equilibrium.

AD-605 913 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVESTIGATION OF PLASMA MOVEMENT IN A COAXIAL SOURCE,
by A. M. Kovalev. 7 Feb 64, 9p
FTD MT64 30; TT 64 71388

Unclassified report

Edited machine trans. of mono. Konferentsiya po Fizike Plazmy i Probleme Upravlyaemogo Termoyadernogo Sinteza (Conference on Plasma Physics and Problems of Controlled Thermonuclear Synthesis) (no. 2) Kharkov, 1960 Doklady, Kiev, 1963, p. 228-231.

Descriptors: (*Coaxial cables, Plasma physics), (*Plasma medium, Acceleration), Electric discharges, Voltage, Magnetic fields, USSR.

From general considerations and from solutions of electrodynamic equations for a coaxial source, it follows that the magnitude of injection speed of plasmoids, together with many other factors, is determined also by the length of the path, on which the plasmoids are accelerated, i.e., by the length of the coaxial. However, first experiments in this direction showed that the magnitude of the speed of the plasmoids attainable in practice depends very slightly on the length of the coaxial. The purpose of the paper is to reveal, insofar as possible, the causes which can lead to such an unexpected result. (Author)

AD-605 925 Div. 25
OTS Prices: HC $1.00/MF $0.50

Boeing Scientific Research Labs., Seattle, Wash.
THEORY OF PINCH EFFECT IN ELECTRON-HOLE PLASMAS,
by James E. Drummond and Betsy Ancker-Johnson.
May 64, 14p D1-82-0356

Unclassified report

Also available from the author.

Descriptors: (*Semiconductors, Plasma physics), (*Plasma medium, Magnetic pinch), (*Magnetic pinch, Theory), Magnetic fields, Field theory, Crystal lattices, Heating, Electric fields, Voltage, Indium alloys, Antimony alloys.

An electron-hole plasma initially injected into a semiconductor at current-carrying contacts is compressed by its self-produced magnetic field. Extremely large power densities occur on the axis of such pinched plasmas. This causes rapid heating of the lattice and plasma within the pinch channel. Analog computer studies were used to follow the thermal ionization on the axis of the pinch as well as the concentration of plasma ejected from the inner region by pressure unbalance. The concentration of ejected particles rapidly builds up to exceed even that produced directly by the rising temperature on the axis. Accompanying the increase in the number of carriers is a large decrease in the voltage necessary to sustain constant current through the sample. The lower voltage reduces heat production on the axis which causes a readjustment of temperature and of the number of carriers producing a slight voltage rise. Thus the small voltage rise which has been attributed previously to the onset of pinching is seen to occur with the establishment of an equilibrium hollow pinch. Such a magnetothermal pinch occurs when the plasma is dissipating moderate power. (Author)

AD-605 934 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ON THE SUDDEN APPLICATION OF A CONCENTRATED LOAD TO AN ELASTIC HALF SPACE,
by John W. Miles. 31 Jul 58, 14p
STL-GM-TN-0165-00166

Unclassified report

Descriptors: (*Elasticity, Loading (Mechanics)), (*Loading (Mechanics), Elasticity), Deformation, Integrals, Vector analysis.

An exact solution for the sudden application of a concentrated load to an elastic half-space is evaluated in simple terms for points on the axis (directly under the load). (Author)

AD-605 936 Div. 25, 27
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angles, Calif.
FREE TRANSVERSE VIBRATIONS OF A SOLID ELASTIC MASS IN AN INFINITELY LONG, RIGID, CIRCULAR-CYLINDRICAL TANK,
by J. H. Baltrukonis. 29 Dec 58, 24p
STL-GM-TR-0165-00529, STL-EM-8-26

Unclassified report

Descriptors: (*Fuel tanks, Cylindrical bodies), (*Rocket motors (Solid propellant), Vibration), Tanks (Containers), Elasticity, Mathematical analysis, Motion, Equations, Programming (Computers).

Exact solutions of the elasticity equations of motion in

AD-605 991 Div. 25, 14
OTS Prices: HC $2.00/MF $0.50

Columbia Univ., New York.
STRAIN ENERGY FUNCTIONS FOR FILLED ELASTOMERS.
Technical rept. no. 25,
by M. Shinozuka and A. M. Freudenthal. Jul 64, 42p
Contract Nonr 266 78, Proj. NR064 446
Unclassified report

Descriptors: (*Elastomers, Strain (Mechanics)), (*Strain (Mechanics), Elastomers), Isocyanate plastics, Potassium compounds, Chlorides, Elasticity, Functions, Energy, Deformation, Mathematical analysis, Stresses, Composite materials.

It is the purpose of this research to investigate possible forms of elastic strain energy functions which reproduce the fundamental behavior of compressible, isotropic filled elastomers as observed in experiments. Three different forms of the strain energy function are considered although they can be classified into two essentially different classes: in the first case, the function is assumed to be the sum of the distortional and the volumetric strain energy, while in the second it represents a possible modification of Mooney's strain energy function. For these three strain energy functions, the relations between axial and lateral deformations under uniaxial tension are plotted together with the result of experiments performed on dumbell-shaped specimens of a KCl-filled polyurethane. The relations in uniaxial tension and compression between the axial stress and deformation are also plotted. (Author)

AD-605 994 Div. 25, 6
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
THE ELASTIC SCATTERING CROSS SECTION FOR ALUMINUM VAPOR WITH LOW ENERGY ELECTRONS,
by Lawrence Baylor Robinson. 10 Oct 56, 4p
GM-36.1-137
Unclassified report

Descriptors: (*Radar reflections, Vapor), (*Vapors, Aluminum), (*Aluminum, Radar echo areas), Scattering, Electromagnetic waves, Vapors, Electrons, Momentum, Mathematical analysis, Energy.

AD-605 996 Div. 25, 4
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
THE MOMENTUM TRANSFER CROSS SECTION OF ATOMIC NITROGEN AND ATOMIC OXYGEN FOR LOW ENERGY ELECTRONS, PART I,
by Lawrence Baylor Robinson. 13 Jun 56, 8p
GM36.1-19, GM-TR-37
Unclassified report

Descriptors: (*Nitrogen, Electron capture), (*Oxygen, Electron capture), Scattering, Momentum, Polarization, Potential theory, Field theory, Phase shift.

An attempt is made to calculate the momentum transfer cross section of atomic nitrogen and atomic oxygen for electrons, especially in the low energy region. Part I is an introduction to the problem with some preliminary results on nitrogen. (Author)

AD-605 999 Div. 25
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MEMBRANE STRESSES IN SKEW CIRCULAR CONES. PART V. CONE LOADED BY ITS OWN WEIGHT,
by P. Seide. 24 Oct 55, 12p
Unclassified report

Descriptors: (*Conical bodies, Stresses), (*Membranes, Stresses), Loading (Mechanics), Mathematical analysis, Analytic geometry, Trigonometry, Weight, Thickness, Differential geometry.

This paper contains an investigation of a problem in which end displacement boundary conditions cannot be taken into account, and of the stress distribution in a skew circular cone loaded by its own weight. These results may be of use in calculating stresses due to high accelerations.

AD-606 006 Div. 25
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge Inc., Los Angeles, Calif.
LOW TEMPERATURE PHENOMENA,
by M. U. Clauser, E. C. Crittenden, Jr., J. N. Cooper, and F. W. Schmidlin. 15 Jan 58, 8p
Unclassified report

Descriptors: (*Superconductors, Transition temperature), (*Low-temperature research, Superconductivity), (*Wires, Superconductivity), (*Films, Superconductivity), Electric currents, Magnetic fields, Nucleation, Tantalum, Crystal structure, X-ray diffraction analysis, Temperature.

Investigations of transitions between normal and superconducting states in thin films and wires are reported.

AD-606 009 Div. 25, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
INFLUENCE COEFFICIENTS FOR EDGE-LOADED SHORT, THIN CONICAL FRUSTRUMS,
by J. H. Baltrukonis. 30 Jan 58, 26p STL-EM-8-2,
STL-GM-TR-0165-00317
Contract AF04 647 165
Unclassified report

Descriptors: (*Conical bodies, Loading (Mechanics)), (*Matrix algebra, Conical bodies), Special functions (Mathematical), Series, Numerical analysis, Deflection, Stresses, Structural shells.

An exact solution is obtained in terms of Kelvin functions for axisymmetrically edge-loaded, short, thin conical frustrums. Expressions for the edge deflectional and rotational influence coefficients are presented in matrix form. Approximate expressions for the influence coefficients are evolved by using one-term asymptotic expansions for the Kelvin functions. It is shown that the range of validity is somewhat larger for this approximate solution than for the solution by Horvay, Linkous, and Born (Analysis of short, thin, axisymmetrical shells under axisymmetrical edge loading). (Author)

AD-606 014 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE LANGEVIN EQUATION AND THE A. C. CONDUCTIVITY OF NON-MAXWELLIAN PLASMAS,
by P. Molmud. 16 Sep 58, 15p STL-GM-47.3-43
Unclassified report

Descriptors: (*Plasma physics, Electrical conductance),

as the velocity of the load is inferior to, intermediate to, or exceeds both of the two sonic speeds. It is argued that the results give a qualitative picture of the importance of refraction in a layered, elastic half-space subjected to a moving blast-wave. (Author)

AD-605 970 Div. 25
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
STRESSES AND DEFORMATIONS OF THIN, PRESSURIZED CYLINDRICAL SHELLS,
by Eric Reissner. 17 Oct 55, 35p AM-5-3
Unclassified report

Descriptors: (*Cylindrical bodies, Mechanical properties), (*Elastic shells, Mechanical properties), Stresses, Deformation, Pressure, Loading (Mechanics), Equations, Mathematical analysis.

The report discusses a system of equations which is suitable for the analysis of thin, circular, cylindrical, elastic shells under the following assumption: The effect of internal pressure is of sufficient magnitude to make the bending stiffness of the shell walls unimportant for the load-carrying characteristics of the shell. Futhermore, it is assumed that deflections are small enough to allow use of a linearized system of equations. (Author)

AD-605 972 Div. 25
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MEMBRANE STRESSES IN SKEW CIRCULAR CONES. I. GENERAL THEORY.
P. Seide. 20 Jul 55, 29p
Unclassified report

Descriptors: (*Conical bodies, Stresses), (*Membranes, Stresses), Theory, Strain (Mechanics), Deformation, Analytic geometry, Differential equations, Trigonometry.

The present investigation is concerned with membrane stress states in skew circular cones; i.e., surfaces generated by moving a straight line, passing through a fixed point in space, along the circumference of a fixed circle. A right circular cone results as a special case when the line joining the center of the circle and the fixed point is normal to the plane of the circle. The analysis is complicated by the unsymmetric geometry of the cone surface and by the circumstance that a convenient choice of directions of stress and displacements involves a skew coordinate system. In the present paper stress-equilibrium equations, stress-strain relationships, and expressions for strains in terms of displacements, and displacements in terms of strains are derived. The application of the theory to various problems will be discussed in a succeeding paper. (Author)

AD-605 974 Div. 25
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MEMBRANE STRESSES IN SKEW CIRCULAR CONES. PART II. CONES SUBJECTED TO END FORCES ONLY,
by P. Seide. 24 Oct 55, 27p
Unclassified report

See also AD-605 972.

Descriptors: (*Conical bodies, Stresses), (*Stresses, Membranes), Force (Mechanics), Rings, Deformation, Mathematical analysis.

A problem of special interest is the stress distribution in truncated skew cones subject to end forces and moments only. The cone ends are reinforced by stiffening rings or bulkheads that are free to distort within their plane but act as the rigid bodies for movements perpendicular to their plane. While this representation of the rings is somewhat unrealistic, more exact boundary conditions for in-plane deformations are not permitted by the membrane-stress theory.

AD-605 975 Div. 25
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MEMBRANE STRESSES IN SKEW CIRCULAR CONES. PART IV. CONE SUBJECTED TO INTERNAL PRESSURE,
by P. Seide. 24 Oct 55, 10p
Unclassified report

See also AD-605 974

Descriptors: (*Conical bodies, Stresses), Membranes, Pressure, Mathematical analysis.

AD-605 976 Div. 25
OTS Prices: HC $3.00/MF $0.75

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
NOTES ON ANALYSIS AND DESIGN OF RIGHT CIRCULAR CONICAL SHELLS,
by Paul Seide. 23 Mar 55, 60p RW(AM)-5-10
Unclassified report

Descriptors: (*Conical bodies, Monocoques), Structural shells, Buckling (Mechanics), Rings, Loading (Mechanics), Mathematical analysis, Design.

The report combines several investigations on the analysis and design of thin-walled right circular cones under axial load. In the first part, the axi-symmetrical buckling of monocoque cones of constant wall thickness is solved in a more or less rigorous manner; approximate solutions are given for constant thickness sandwich cones and for cones with stiffeners along the generators, the stiffeners being such that their moment of inertia varies linearly with distance from the vertex. Results for column buckling of right circular cones are discssed. In the second part, the foregoing results for the monocoque cone of constant thickness are used to obtain charts and formulas for minimum weight design. The cones are assumed to be bounded by stiffening rings whose design depends only on those conditions imposed by the cone and its axial load. Analyses are presented for strength, axisymmetric wall buckling, and overall column buckling. Criterions for determining which type of failure is critical for the design of any particular cone are given. (Author)

AD-605 980 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE PROPAGATION OF AN IMPULSE INTO A VISCOUS-LOCKING MEDIUM,
by John W. Miles. 20 Feb 60, 15p
STL-EM-10-2, STL/TR-60-0000-00033
Unclassified report

Descriptors: (*Viscosity, Theory), (*Shock waves, Propagation), Stresses, Strain (Mechanics), Plasticity, Transformations, Compressive properties, Pressure, Mathematical models.

Identifiers: Domains (Crystallography), Bloch-Neel wall transitions, Kerr effect.

The motion of domain walls in thin Ni-Fe films is described when the films are in a continuous field in the light direction with a superimposed alternating field in the hard direction. The experiments show that Bloch-Neel-Bloch wall transitions in films thicker than 900 A and Bloch line displacements in films thinner than 900 A are associated with motion. (Author)

AD-606 047 Div. 25, 27
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
THERMAL RESISTANCE OF TURBINE-BLADE ROOT JOINTS,
by O. T. Il'chenko and V. M. Kapinos. 3 Sep 64, 19p
RSIC 261; TT 64 71435
Unclassified report

Trans. of Energomashinostroenie (USSR) 1959, v. 5, no. 6, p. 23-26.

Descriptors: (*Thermal conductivity, Turbine blades), (*Turbine blades, Thermal conductivity), Joints, Thermal properties, Partial differential equations, Dynamometers, Heat transfer.

The paper discusses the theoretical determination of thermal resistance in forked, de Laval, and fir-tree root joints. The results of the calculation are compared with experimental data from the Thermal Energy Institute of the Academy of Sciences, Ukrainian SSR, the Khar'kov Polytechnical Institute, and Seippel. (Author)

AD-606 051 Div. 25
OTS Prices: HC $1.00/MF $0.50

Westinghouse Research Labs., Pittsburgh, Pa.
RESONANCE MODES AT DEFECTS IN CRYSTALLINE QUARTZ.
Scientific rept. no. 1,
by D. W. Feldman and J. G. Castle, Jr. 17 Jun 64, 16p
Contract AF19 628 3838, Proj. 4608, Task 460801
AFCRL 64 597
Unclassified report

Descriptors: (*Quartz, Resonance), (*Crystal structure, Quartz), Relaxation time, Crystal lattice defects, Silicon compounds, Dioxides, Magnetic fields, Temperature, Nuclear spins, Strain (Mechanics), Crystals.

Identifiers: Raman spin-lattice relaxation time.

The Raman spin-lattice relaxation time, T sub 1R, for the oxygen divavacancy (E sub 1') center in synthetic crystalline quartz measured in applied magnetic fields of 3 KOe is accurately given by 1/T sub 1R = B(e to the x sub 1 power/(e to the x sub 1 power - 1) to the 2nd power)+ C (e to the x sub 2 power/(e to the x sub 2 power - 1) to the 2nd power) + D e to the minus x sub 3 power where the coefficients are B = 0.25/sec, C = 250/sec, D = 300,000/sec, and the characteristic frequencies have the corresponding temperatures of x sub 1T = 20 ± 2K, x sub 2T = 125 ± 10K, and x sub 3T = 1400 ± 300K. The two lower frequencies are interpreted in terms of mechanical resonances being localized at each center and having large resonant amplitudes. The highest frequency is tentatively associated with some of the optical modes of the SiO2 lattice. There is no evidence for relaxation by the acoustic modes having the normal Debye cutoff. (Author)

AD-606 055 Div. 25, 9
OTS Prices: HC $2.00/MF $0.50

Avco-Everett Research Lab., Everett, Mass.
MAGNETOGASDYNAMIC EFFECTS IN THE FLOW BEHIND A SPHERE,
by A. Goldburg and P. O. Jarvinen. Aug 64, 44p
Avco-RN-415
Contract AF04 694 414
BSD TDR64 107
Unclassified report

Descriptors: (*Magnetohydrodynamics, Spheres), (*Spheres, Magnetohydrodynamics), Fluid flow, Incompressible flow, Wakes, Turbulence, Reynolds number, Plasma physics, Equations.

Maxworthy's experiments with the flight of a sphere through an incompressible electrically conducting fluid with an aligned magnetic field showed that transition in the trailing wake was moved to higher fluid mechanical Reynolds numbers. Theoretical and experimental work on suppression of vorticity in uniformly conducting incompressible fluids with imposed uniform transverse magnetic fields was analyzed to find a correlating parameter for C sub D, C sub f and transition to turbulence. Extension of the incompressible problem to the compressible one is based on the observed similarity of the transition processes in the hypersonic and incompressible wakes as suggested by Fay and Goldburg. Average values of the fluid properties in the base region were chosen as typical for the calculation of hypersonic wake transition Reynolds numbers, R and R sub H. Hypersonic experiments were performed. In the first set of runs made at 5 cm Hg pressure, a change in the luminous structure of the flow field occurred possibly suggestive of a change from turbulent to laminar wake flow. In the second set of experiments made at 5 cm and 2 cm Hg pressure, no MHD effect on the hypersonic turbulent flow field was evident. The paper concludes with a discussion of these results.

AD-606 067 Div. 25, 17
OTS Prices: HC $2.00/MF $0.50

Merck and Co., Inc., Rahway, N. J.
STRUCTURAL INVESTIGATIONS IN THERMOELECTRIC MATERIALS.
Summary rept. for 1 Oct 62-30 Sep 63,
by P. I. Pollak, J. B. Conn, E. J. Sheehan, and C. J. Barclay. 30 Sep 63, 33p
Contract NObs88112, Proj. SF0130601
Unclassified report

Descriptors: (*Thermoelectricity, Materials), (*Semiconductors, Crystal structure), Selenium alloys, Copper alloys, Antimony alloys, Selenides, Manganese alloys, Silver alloys, Silicon alloys, Zinc alloys, Cadmium alloys, Germanium alloys, Copper compounds, Vanadium compounds, Sulfites, Vanadium alloys, Niobium alloys, Tantalum alloys, Tellurium alloys, Solid solutions, Thermal conductivity, Resistance (Electrical), Electrical conductance, X-ray diffraction analysis, Crystal lattices.

A study was made of the properties of tetrahedrally-bonded semiconductors generally, and particularly to those possessing superlattices, with especial reference to the effect of such superlattices on the phonon contribution to thermal conductivity. Two lattice types have been dealt with: those based on zinc blende or wurtzite, and those based on sulvanite (Cu3VS4). Some compounds which were prepared turned out to belong to neither of these classifications, and a great many possible compositions proved not to be compounds at all. The negative results are included for completeness.

(Electrical conductance, Plasma physics), Alternating current, Gas ionization, Mathematical analysis, Equations.

The use of the Langevin equation to describe the electrical conductivity of a non-Maxwellian plasma (a weekly ionized gas in which the average electron collision frequency is temperature dependent) may be in error unless it is understood that the dissipative term, g, is complex. In the limiting cases of either high or low pressures the imaginary part of g is negligible. The real and imaginary parts of g are evaluated for these limiting cases, for four different gases; air, helium, Maxwellian gas, water. The real part of g is shown to be the average collision frequency multipled by a numerical factor, the size of which depends on the nature of the gas and the pressure limit.

AD-606 036 Div. 25, 30
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
A CORRECTION TO THIN-FILM HEAT TRANSFER MEASUREMENTS,
by Richard A. Hartunian and Robert L. Varwig.
1 May 61, 46p TDR-594(1217-01)TN-2
Contract AF04 647 594

Unclassified report

Descriptors: (*Heat transfer, Measurement), (*Resistance Thermometers, Calibration), (*Metal films, Thermal properties), Density, Thermal conductivity, Specific heat, Glass, Quartz.

A technique for measuring the temperature dependence of the product of the density, thermal conductivity, and heat capacity of various substrates for thin film resistance thermometers is described. The results for pyrex, quartz, and plate glass, which have been used as backing materials for thin film resistance thermometers, indicate that sizeable errors may be encountered in inferring heat transfer rates from measured surface temperature histories if the thermal properties are assumed constant. The corrections which must be applied to account for the temperature dependence of the thermal conductivity and the specific heat were established through a theoretical solution of the nonlinear one-dimensional heat conduction equation. The magnitude of the correction depends on the material of the substrate and the surface temperature. For pyrex at 150C it is about 45% and for fused quartz and glass about 15%. (Author)

AD-606 042 Div. 25
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
DEVELOPMENT OF DIFFUSION CELL ANALOG FOR SOLVING TRANSIENT HEAT TRANSFER PROBLEMS IN WHICH A PHASE TRANSITION OCCURS,
by H. Hashemi and C. M. Sliepcevich. 15 Sep 64, 16p OURI-TM-1454-5-1
Contract DA18 035AMC116A, Proj. 1454

Unclassified report

Descriptors: (*Heat transfer, Simulation), (*Diffusion, Phase studies), Thermodynamics, Models (Simulations), Fluid flow, Liquids, Mixtures.

The memorandum relates to the development of an analog solution of the two-dimensional transient temperature field in a continuous object undergoing a change of phase due to some prescribed temperature conditions imposed on its exposed surface. The analog solution is based on the measurements of the concentration profile obtained by molecular diffusion in a partially miscible liquid-liquid binary mixture in a diffusion cell. The diffusion analog can be used to determine movements of the interface and the temperature distribution, when the boundary of the region under consideration is not a simple geometrical surface and the boundary conditions are strongly dependent on the location and time. The use of this cell to solve several cases of practical interest, such as periodic and irregular boundary conditions, is outlined. (Author)

AD-606 043 Div. 25
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
DIFFUSION ANALOG OF TWO-DIMENSIONAL HEAT CONDUCTION,
by H. Hashemi and N. Hardwicke. 15 Sep 64, 18p
OURI-TM-1454-5-2
Contract DA18 035AMC116A, Proj. 1454

Unclassified report

Descriptors: (*Diffusion, Phase studies), (*Thermal conductivity, Simulation), Liquids, Mixtures, Differential equations, Heat transfer, Phenols, Water.

The objectives of the study were: (1) to develop a method for determining the dependence of diffusivity on concentration; and (2) to determine the effect of phenol concentration in the boundary solvent on the diffusivity for the water-rich phase of the system phenol-water. (Author)

AD-606 044 Div. 25
OTS Prices: HC $2.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
INVESTIGATION OF SURFACE ACTIVE AGENTS AND OF SURFACE EFFECTS IN A DIFFUSION CELL,
by N. L. Hardwicke. 15 Sep 64, 28p
OURI-TM-1454-3
Contract DA18 035AMC116A, Proj. 1454

Unclassified report

Descriptors: (*Diffusion, Phase studies), (*Surface-active substances, Effectiveness), Liquids, Mixtures, Surface tension, Capillary tubes, Heat transfer, Simulation, Fluid flow, Phenols, Water.

The objectives of the work were: (1) to measure the surface tension of phenol-saturated water and water-saturated phenol and to measure the interfacial tension between the two phases; (2) to determine the effectiveness of wetting agents and detergents in reducing the interfacial tension between phenol and water; (3) to determine the effect of uneven water flow to the cell boundary; to determine the effect of the density difference of the liquids; to determine the effect of a wetting agent in the water on diffusion in the cell. (Author)

AD-606 046 Div. 25, 30
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
DOMAIN WALL MOTION IN THIN NI-FE FILMS,
by Simon Middelhoek. 31 Aug 64, 14p
RSIC 256; TT 64 71434

Unclassified report

Trans. of Zeitschrift fur Angewandte Physik (West Germany) 1962, v. 14, no. 4, p. 191-193.

Descriptors: (*Ferromagnetic materials, Films), (*Magneto-optic effect, Ferromagnetic materials), West Germany, Metal films, Nickel, Iron, Magnetic fields, Motion, Hysteresis, Thin films (Storage devices), Anisotropy, Crystal structure, Magnetism.

the scheme involves analysis of the velocity distribution of a beam of molecules incident on a solid surface and analysis of velocity and spatial distribution of the molecules after surface collision. The experimental work has thus far been directed towards the development of: (1) a molecular velocity spectrometer, (2) a vacuum apparatus, and (3) a signal detection and discrimination system. The report includes primarily a description of these components.

AD-606 081 Div. 25, 17
OTS Prices: HC $1.00/MF $0.50

Stanford Univ., Calif.
AN ANALYSIS OF CREEP RUPTURE.
Technical rept. no. 5,
by Robert L. Carlson. Feb 64, 19p SUDAER-183
Contract Nonr225 47, Proj. NR064 434
Unclassified report

Descriptors: (*Creep, Rupture), (*Failure (Mechanics), Creep), Ductility, Loading (Mechanics), Metals, Tensile properties, Stresses, Compressive properties, Buckling (Mechanics), Structures, Elasticity, Plasticity, Hardness, Brittleness, Deformation, Temperature, Equations, Aluminum alloys.

Ductile creep rupture is considered and an analysis of a work-hardening plastic material which is subject to creep is made. Under a constant tensile load, the true stress acting on a creep specimen increases and the rate of work-hardening decreases. It is shown that tensile instability develops when the rate of work-hardening becomes equal to the true stress. It is noted that both tensile instability and creep rupture, and compressive instability and column creep buckling are controlled by the current state of work-hardening. (Author)

AD-606 083 Div. 25, 15
OTS Prices: HC $3.00/MF $0.75

Stanford Univ., Calif.
A GENERALIZED METHOD FOR TREATING SINGULAR PERTURBATION PROBLEMS,
by Ali Hasan Nayfeh. Jun 64, 62p SUDAER-193
Contract AF49 638 1274
AFOSR 64 1306
Unclassified report

Descriptors: (*N-body problem, Perturbation theory), (*Perturbation theory, N-body problems), (*Differential equations, Boundary value problems), Series, Numerical methods and procedures.

Some of the existing methods of treating singular perturbation problems are studied, and a generalized method for solving such problems is developed. The generalized method was applied to a restricted three-body problem and to a general second-order linear ordinary differential equation with a turning point of arbitrary order. The results of the latter are used in obtaining the asymptotic expansions of the eigenvalues and eigenfunctions of a second-order linear equation with two turning points of arbitrary order. A special case of the eigenvalue problem is the Graetz problem. It arises in finding the temperature distribution of a fluid with constant properties having a parabolic velocity profile which enters suddenly into a round tube whose wall is kept at a different constant temperature. (Author)

AD-606 101 Div. 25, 4
OTS Prices: HC $3.00/MF $0.75

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE MEASUREMENT OF THE VAPOR PRESSURE OF ATOMIC SPECIES FROM SPECTROPHOTOMETRIC MEASUREMENTS OF THE ABSORPTION OF RESONANCE LINES. I. TEST OF THE METHOD ON THE VAPOR PRESSURE OF SODIUM.
Technical information series,
by Guido L. Vidale. May 60, 59p R60SD330
Contract AF04 647 269
PB 148 206
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Vapor pressure, Resonance absorption), (*Sodium, Vapor pressure), Absorption spectrum, Line spectrum, Spectroscopy, Spectrophotometers, Molecular properties, Density, Atoms.

A method was developed for studying the equilibrium vapor pressure of atomic species over refractory ceramics. It consists of measuring the absorption coefficient of the hot equilibrium vapor at the center of an atomic resonance line. A resonance line of known oscillator strength for the atomic species under examination is generated in liquid nitrogen cooled, hollow cathode discharge tube, and the absorption of this line by a known length of equilibrium vapor present in an isothermal cell is measured using spectrophotometric techniques. After correcting for the various causes of line broadening of the resonance line, the measured absorption is used to calculate the density of the atomic species. The experimental and theoretical techniques are described, and the results of a reinvestigation of the vapor pressure of sodium metal at 400K are given. It is shown that the individual vapor pressure measurements have a root mean square deviation of 12%, and that their average differs from the best literature values by less than 3%. The various sources of error are discussed quantitatively, and it is shown that pressure of 10 to the minus 8th power to 10 to the minus 9th power atmospheres of atomic species can be generally measured with an accuracy of ± 20%. (Author)

AD-606 102 Div. 25, 4
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE MEASUREMENT OF THE VAPOR PRESSURE OF ATOMIC SPECIES FROM SPECTROPHOTOMETRIC MEASUREMENTS OF THE ABSORPTION OF RESONANCE LINES. II. THE OSCILLATOR STRENGTH OF THE Cu3247 LINE.
Technical information series,
by Guido L. Vidale. May 60, 35p R60SD331
Contract AF04 647 269
PB 148 207
Unclassified report

Descriptors: (*Vapor pressure, Resonance absorption), (*Copper, Line spectrum), Absorption spectrum, Spectroscopy, Spectrophotometers, Molecular properties, Density, Doppler effect, Atoms.

The oscillator strength of the Cu3247 resonance line was obtained from the experimentally determined absorption coefficient at its center. This resonance line was generated in a hollow cathode discharge tube operated at liquid nitrogen temperature and its absorption by an amount of copper vapor of known length and density was measured spectrophotometrically. The value of f was calculated from this measured absorption by taking into account the effect of Doppler and pressure broadening and of the hyperfine structure of the line. The copper vapor consisted of the equilibrium vapor over copper in an isothermal cell, in the presence of a sufficient density of inert gas to diffusion limit the effective

AD-606 068 Div. 25, 17
OTS Prices: HC $1.00/MF $0.50

Merck and Co., Inc., Rahway, N. J.
STRUCTURAL INVESTIGATIONS IN THERMOELECTRIC MATERIALS.
Quarterly rept. no. 4, 1 Jul-30 Sep 63,
by P. I. Pollak, J. B. Conn, E. J. Sheehan, and C. J. Barclay. 1963, 10p
Contract NObs88112, Proj. SF013 0601
Unclassified report

Descriptors: (*Thermoelectricity, Materials), (*Intermetallic compounds, Thermoelectricity), (*Phase studies, Intermetallic compounds), Copper alloys, Vanadium alloys, Niobium alloys, Tantalum alloys, Siliver alloys, Chromium alloys, Manganese alloys, Nickel alloys, Selenium alloys, X-ray diffraction analysis, Zone melting, Semiconductors, Heat treatment, Zinc alloys, Antimony alloys, Cadmium alloys, Arsenic alloys, Molybdenum alloys, Tungsten alloys, Lanthanum alloys, Germanium alloys, Tellurium alloys, Crystal structure.

A study was made of the sulvanite group of compounds. It has been shown that uncontrolled freezing of compositional melts Cu3(V, NB, Ta) (Se, Te)4 seldom yields a pure phase. The case of Cu3VTe4 has been dealt with in detail as it is typical, and the rather low melting point makes it convenient to handle. None of the sulvanites thus far examined melts congruently; Cu3VTe4 displays a stable and unstable freezing behavior which it follows unpredictably from the unseeded liquid. The unstable branch leads to a solid containing considerable amounts of copper tellurides, notably Rickardite (Cu4Te3). Such solid reverts to pure Cu3VTe4 upon annealing. The solid connot be zone refined if the unstable freezing course occurs, as the capsule invariably shatters. The presence of pure seed phase allows successful zoning to be done. Contrary to the preliminary estimate of the third period, Cu3VTe4 is a non-degenerate semiconductor; degeneracy is a characteristic of Rickardite contamination. Possible compounds isoelectronic and isostructural with the sulvanites, such as (IIb)3(VIb)(Va)4 and (IIIb)3(VIIb)(IVa)4 are being sought. To date, none has been found.

AD-606 069 Div. 25, 17
OTS Prices: HC $1.00/MF $0.50

Merck and Co., Inc., Rahway, N. J.
STRUCTURAL INVESTIGATIONS IN THERMOELECTRIC MATERIALS.
Quarterly rept. no. 2, 1 Jan-31 Mar 63,
by P. I. Pollak, J. B. Conn, E. J. Sheehan, and C. J. Barclay. 1963, 16p
Contract NObs88112, Proj. SF013 06 01
Unclassified report

Descriptors: (*Thermoelectricity, Materials), (*Intermetallic compounds, Thermoelectricity), (*Phase studies, Intermetallic compounds), Copper alloys, Zinc alloys, Cadmium alloys, Tin alloys, Selenium alloys, Antimony alloys, Silver alloys, Germanium alloys, X-ray diffraction analysis, Crystal lattices, Electrical conductance, Thermal conductivity, Resistance (Electrical), Solid solutions, Zone melting, Semiconductors, Mercury alloys, Crystal structure, Tellurium alloys.

An investigation was made into the thermoelectric properties of homogeneous quaternary systems has been launched with exploration of compositional types: Cux (Zn, Cd, Hg) (Ge, Sn) (Se, Te)2x. The first member representing a valid phase was found to be a selenium-deficient Cu2CdSnSe4. The composition is more exactly represented by Cu12Cd6Sn6Se23. The compound possesses a complex superlattice based on zinc-blende, and melts at 765 degrees. It is a p-type semiconductor. The system Cu12Cd6+xSn6-xSe23 is almost invariant for x -2 <x< +1. For x> +1, degeneracy sets in; for x< 0, crystal lattice disorder occurs. Tin shows no sign of donar activity when in excess. Homologs of the cadmium-tin quaternary are being surveyed. Cu2HgSnSe4 forms a phase similar to the cadmium compound, but high mercury vapor pressure has defeated efforts to zone-level it. The germanium composition Cu2CdGeSe4 has a wurtzite-type structure, but shatters tubes when the melt freezes. No silver or tellurium homologs have yet been found.

AD-606 070 Div. 25, 17
OTS Prices: HC $1.00/MF $0.50

Merck and Co., Inc., Rahway, N. J.
STRUCTURAL INVESTIGATIONS IN THERMOELECTRIC MATERIALS.
Quarterly rept. no. 3, 1 Apr-30 Jun 63,
by P. I. Pollak, J. B. Conn, E. J. Sheehan, and C. J. Barclay. 30 Jun 63, 20p
Contract NObs88112, Proj. SF013 0601
Unclassified report

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Descriptors: (*Thermoelectricity, Materials), (*Intermetallic compounds, Thermoelectricity), (*Phase studies, Intermetallic compounds), Copper alloys, Cadmium alloys, Tin alloys, Zinc alloys, Manganese alloys, Indium alloys, Antimony alloys, Vanadium alloys, Sulfites, Tellurium alloys, Tantalum alloys, Chromium alloys, Nickel alloys, Silver alloys, X-ray diffraction analysis, Crystal lattices, Electrical conductance, Thermal conductivity, Resistance (Electrical), Semiconductors, Solid solutions, Zone melting, Selenium alloys, Crystal structure.

Temperature curves of resistivity and Seebeck coefficient for the defect quaternary Cu12Cd6Sn6Se23 show an almost discontinuous anomaly in the range 125-175C, characterized by abrupt increase in resistivity and decrease in Seebeck coefficient. Compositional variation of parameters for the system Cu12Cd6+xSn6-xSe23 has been completely surveyed. Homogeneity range is very limited, and the only pronounced effect is a strong doping by excess cadmium. The composition Cu12Zn6Sn6Se23 has been shown to be a random solid solution of ZnSe in Cu2SnSe3. The compositions CuCd2InSe4, CuCd2SbSe4, Cu3Cd2SbSe5, Cu4Cd2InSbSe8, and CuCd2SbSe5 were either solid solutions or inhomogeneous. On the other hand Cu2MnSnSe4-x, with equilibrium composition similar to Cu12Cd6Sn6Se23, is ordered and very similar to the cadmium quaternary. Both compounds are clearly related structurally to the mineral stannite (Cu2FeSnS4), but unlike it, are not exactly tetragonal. An examination into the properties of ternaries having the structure of sulvanite (Cu3VS4) has been initiated. Bonding in this system is tetrahedral, but not of diamond type.

AD-606 078 Div. 25
OTS Prices: HC $1.00/MF $0.50

Massachusetts Inst. of Tech., Cambridge.
MOLECULAR BEAM-SURFACE INTERACTIONS.
Final rept.
1964, 18p
Grant AF AFOSR131 63
AFOSR 64 1661
Unclassified report

Descriptors: (*Molecular beams, Instrumentation), Molecules, Distribution, Mass spectroscopy, Spectrum analyzers, Vacuum systems, Pulse discriminators, Design.

The purpose of the work was to study the detailed behavior of gas molecules at a solid boundary in order to gain understanding of gas-solid collision phenomena. Experimentally,

26. Production and Management

AD-605 162 Div. 26, 12
OTS Prices: HC $3.00/MF $0.75

Lockheed Missile and Space Co., Sunnyvale, Calif.
MISSILE SYSTEMS DIVISION VALUE ENGINEERING.
25 Sep 61, 72p LMSC-800935
Contract NOrd17017

Unclassified report

Descriptors: (*Guided missiles (Underwater-to-surface), Industrial production), (*Systems engineering, Guided missiles), (*Management engineering, Guided missiles), Costs, Management planning, Display systems, Manufacturing methods, Guided missiles (Surface-to-surface), Navy.

The MSD Value Engineering program is directed by a Value Engineering Control Committee (VECC). This committee is composed of responsible personnel from the major operating segments involved in the POLARIS program, and is under the chairmanship of the Manager of Production Support. The VECC performs the following functions: (1) Establishes and implements procedures for directing and coordinating the VE program. (2) Monitors VE activities and provides guidance where needed. (3) Approves VE reports which are to be submitted to management. (4) Reviews any VE problems which may arise and renders decisions when necessary to solve these problems. (5) Ensures that all the required functions listed in Management Policy and Procedure Number 9.61, 'Value Engineering,' are carried out satisfactorily within the POLARIS organization.

AD-605 195 Div. 26, 17
OTS Prices: HC $6.00/MF $1.25

Wah Chang Corp., Albany, Oreg.
TUNGSTEN EXTRUSION DEVELOPMENT PROGRAM.
Final technical documentary rept. for 2 Dec 60- 27 Jun 63,
by A. E. Riesen, C. T. Wang, and S. A. Worcester.
27 Jun 63, 224p
Contract AF33 600 42395, Proj. 7 793
ML TDR64 217

Unclassified report

Descriptors: (*Tungsten alloys, Extrusion), (*Extrusion, Tungsten alloys), Molybdenum alloys, Melting, Sintering, Powder metallurgy, Heat-resistant metals and alloys, Tungsten, Castings, Dies, Lubrication, Coatings, Microstructure, Surface properties, Heat treatment, Hardness.

Procedures were developed for preparation of tungsten-3 percent molybdenum extrusion billets by arc casting and by pressing and sintering. Round extrusions were made to evaluate die lubrication and die coatings in temperatures ranging from 3200F to 4000F at reduction ratios as high as 17:1. Efforts to obtain wrought extrusion billets by extruding large cast ingots at 2300F and 2.6:1 were not successful because longitudinal cracking developed in the extrusion. Efforts to meet program target dimensional and surface requirements with arc cast tungsten-3 percent molybdenum were unsuccessful. However, extruded tungsten 'T' sections up to 138 inches long having surface finishes better than 100 RMS and dimensional run-out within .010 inch were successfully produced from pressed and sintered starting material. The extrusion conditions necessary to achieve the program target dimensions resulted in a hot-worked microstructure which has a high ductile-brittle transition temperature and relatively low strength. Because of the undesirable microstructure achieved and the lack of requirement for tungsten extrusions of the target configuration, the program was terminated at the end of the Phase III effort. (Author)

AD-605 231 Div. 26, 7, 13
OTS Prices: HC $7.40/MF $2.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRIC WELDING EQUIPMENT AND AUTOMATION OF WELDING IN CONSTRUCTION,
by S. G. Sarafanov, S. M. Taz'ba, Yu. Ya. Terent'ev, and E. S. Feder. 20 Jul 64, 438p
FTD MT63 284; TT 64 71291

Unclassified report

Edited machine trans. of mono. Elektrosvarochnoe Oborudovanie i Avtomatizatsiya Svarochnykh Rabot v Stroitel'stve, Leningrad/Moscow, 1962, 350p.

Descriptors: (*Welding, Electrical equipment), (*Arc welding, Automation), Construction, Industries, Power equipment, Generators, Power transformers, Resistance welding, Spot welding, Machines, Automatic, Structures, Design, Wiring diagrams, USSR.

The main types of electric welding equipment and systems for automation of welding applied in construction are considered. Diagrams and characteristics of machines, transformers and automata for arc welding, and machines for resistance welding, including automatic machines for welding reinforcing grids are covered. The book is designed for engineers and technicians working in construction and the building materials industry.

AD-605 286 Div. 26, 17
OTS Prices: HC $6.00/MF $1.25

TRW Electromechanical Div., Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
DEVELOPMENT OF WELDING PROCEDURES AND FILLER MATERIALS FOR JOINING HIGH STRENGTH LOW ALLOY STEELS.
Report for Jun 63-Jun 64,
by J. M. Faulkner, G. L. Hanna, and J. V. Peck. Aug 64, 266p
Contract AF33 657 11229, Proj. 7351, Task 735102
ML TDR64 255

Unclassified report

Descriptors: (*Steel, Welding), (*Welding, Steel), Nickel alloys, Cobalt alloys, Carbon alloys, Chromium alloys, Nickel alloys, Molybdenum alloys, Martensite, Bainite, Microstructure, Welds, Thermal joining, Ductility, Fracture (Mechanics), Toughness, Tensile properties, Welding rods, Heat treatment, Hardness, Brittleness, Sheets, Metal plates.

A research program was conducted to develop welding procedures and filler materials for joining a martensitic and a bainitic steel having yield strengths of 180 to 200 ksi with adequate ductility and fracture toughness. The steels selected for this work were HP 9-4-20, a martensitic steel developed by Republic Steel Company, and AMS 6435 austempered to produce a bainitic structure. Welding procedures were developed for gas tungsten-arc (TIG) and gas metal arc (MIG) welding HP 9-4-20 plate and sheet material using filler wires of essentially matching compositions. Minor porosity was observed in all welds. In some cases, particularly at the higher welding speeds, intolerable porosity was encountered. The minor porosity might be eliminated in future work by adding discrete amounts of deoxidizers such as titanium and aluminum to the filler wire. Procedures were developed for making MIG and TIG welds in AMS 6435 plate material which was austempered at 575 F. Welds made at 4 ipm with a 575 F preheat and post heat for 2 hours met the 180 ksi yield strength requirement. In no instance did the AMS 6435 weld joints meet the basic yield strength requirement because of a serious loss in heat affected zone strength due to overtempering. In addition to the poor joint properties, the fracture toughness, KIC, was

cell length. The reported result f = 0.32 is compared with literature values, and its probable error is estimated. (Author)

AD-606 126 Div. 25
OTS Prices: HC $3.00/MF $0.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH.
1 Sep 64, 99p LL1964 2
Contract AF19 628 500
ESD TDR64 351

Unclassified report

Descriptors: (*Solid state physics, Reviews), (*Lasers, Reviews), (*Semiconductors, Reviews), Semiconductor devices, Diodes (Semiconductor), Crystal growth, Raman spectroscopy, Radiofrequency generators, Crystals, Transformations, Thermodynamics, Optical phenomena, Spectroscopy, Crystal substructure, Hall effect, Magnetism, Nuclear resonance, Atomic orbitals, Nuclear spins.

Summaries are given of research projects in the following areas: Solid state devices, lasers, materials, band structure and spectroscopy of solids, magnetism and resonance.

AD-606 131 Div. 25, 13, 31
OTS Prices: HC $1.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
YIELD FAILURE OF STIFFENED CYLINDERS UNDER HYDROSTATIC PRESSURE,
by M. E. Lunchick. Jan 59, 9p
Proj. NS731 038
DTMB 1291; PB 163 378

Unclassified report

Reprinted from Proceedings of the U. S. National Congress of Applied Mechanics (no. 3) held at Brown University, Providence, R. I., 11-14 Jun 58.

Descriptors: (*Stiffened cylinders, Hydrostatic pressure), (*Hydrostatic pressure, Stiffened cylinders), Cylindrical bodies, Structural shells, Compressive properties, Failure (Mechanics), Stresses, Measurement.

Experimental results are presented of hydrostatic tests of stiffened cylinders failing by axisymmetric yielding. These results are compared with existing theories predicting the collapse pressure as well as a new method presented in this paper. This method is based on an elastic-plastic analysis of a stiffened cylinder comprised of an ideally plastic material. The experimental collapse pressures agree best with theories using a Hencky-von Mises criterion of yielding and allowing for plastic reserve strength after the initiation of yielding. (Author)

AD-606 140 Div. 25
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
ON A NEW METHOD FOR THE EXPERIMENTAL STUDY OF ELASTIC STRESSES,
by Cu. Fabry. 3 Sep 64, 8p
RSIC 262; TT 64 71441

Unclassified report

Trans. of Academie des Sciences, Paris. Comptes Rendus (France) 1930, v. 190, p. 457-460.

Descriptors: (*Glass, Stresses), (*Elasticity, Measurement), Refraction, Thickness, Optical properties, Interferometers, (Models (Simulations)), Optical analysis.

An experimental study of two-dimensional elasticity problems, making use of the birefringence of glass subjected to stresses was conducted. A suitably cut glass sheet -- a reduced model of the body to be studied -- was subjected to forces proportional to those which act on this body in reality; it became birefringent and, at each of its points, behaved as a crystalline sheet; the axes of this sheet coincided with the directions of the principal stresses and the measurement of its birefringence furnished the difference of these two stresses.

AD-606 143 Div. 25
OTS Prices: HC $3.00/MF $0.75

Institute of Engineering Research, Univ. of California, Berkeley.
A GENERAL THEORY OF AN ELASTIC-PLASTIC CONTINUUM,
by A. E. Green and P. M. Naghdi. Sep 64, 66p
AM-64-16
Contract Nonr222 69, Proj. NR064 436

Unclassified report

Descriptors: (*Elasticity, Continuum mechanics), (*Plasticity, Continuum mechanics), (*Continuum mechanics, Theory), Thermodynamics, Equations, Deformation, Dynamics, Entropy, Field theory, Stresses, Tensor analysis, Loading (Mechanics), Strain (Mechanics), Metals.

Contents: Dynamical and thermodynamical equations; alternative form of the basic theory; large deformation elasticity; theory of an elastic-plastic continuum; thermodynamical restrictions; an isotropic elastic-plastic continuum; alternative form of the theory of elastic-plastic continuum; elastic-perfectly plastic continuum; infinitesimal theory; special cases of the general theory.

In many situations the failure of equipment while in operation is undesirably costly, or hazardous. For such reasons it may be prudent to institute a policy of planned replacement of units before they fail. However, the costs of such a policy must be militated against the costs of operational failures. In all likelihood, moreover, the over-all system costs will be constrained to fall within a given budgetary allocation. To study the question of frequency of planned replacement under a budgetary constraint, a probabilistic criterian is developed. Attention is directed to those situations in which average system cost is not as important as staying within a fixed budget. Only non-sequential policies are examined although the notions are extensible to the more general case.

AD-605 515 Div. 26, 15, 32
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE (s-1,s) INVENTORY POLICY UNDER COMPOUND POISSON DEMAND: A THEORY OF RECOVERABLE ITEM STOCKAGE,
by G. J. Feeney and C. C. Sherbrooke. Sep 64, 37p
RM-4176-PR
Contract AF49 638 700
Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Inventory analysis, Stock level control), (*Stock level control, Inventory analysis), Probability, Distribution (Economics), Logistics, Queueing theory, Inventory control.

This memorandum derives the simple analytic solution to the special, but important inventory problem in which the optimal policy is to reorder a unit whenever one is demanded. The demand distribution can be any compound Poisson; the resupply distribution is arbitrary. Both the backorder case and the lost sales case are solved by generalizing a queueing theorem due to Palm. The procedure is to calculate by item the steady state probabilities for the number of units in resupply (or repair). These probabilities completely describe the item's long term behavior, and are simply the normalized values of the compound Poisson demand distribution based on the mean of the resupply distribution but not on the distribution itself. Knowledge of these state probabilities enables us to compute several measures of item supply performance as a function of the spare stock, s. Traditional inventory analysis can then be applied to minimize total cost based on estimates of holding cost and supply performance cost. The appendices contain a description of the algorithm and the computer program for calculating stuttering Poisson state probabilities and the measures of effectiveness for the backorder case. Numerical illustrations are also provided. (Author)

AD-605 572 Div. 26, 14, 31
OTS Prices: HC $3.00/MF $0.50

Aerojet-General Corp., Azusa, Calif.
DETERMINATION OF EFFECTS OF MATERIALS AND PROCESS VARIABLES ON FILAMENT-WOUND STRUCTURES.
Quarterly progress rept. no. 3, 15 May-15 Aug 64,
by B. E. Chester. Sep 64, 54p AGC-0827-02-3
Contract N140 131 75687B X, Projs. SF012 01 03, 6438, Task 217
Unclassified report

See also: AD-602 279.

Descriptors: (*Filament wound construction, Composite materials), (*Composite materials, Filament wound (Construction)), Reinforcing materials, Glass textiles, Non-destructive testing, Hydrostatic pressure, Ultrasonic radiation, Shear stresses, Cylindrical bodies, Plastics, Physical properties, Submarine hulls, Test methods, Pressure vessels, Impregnation, Winding.

Six additional specimens were fabricated and tested during this report period. Mechanical and physical test data indicated that the values obtained for specific gravity, density, horizontal shear, and modified cylinder shear were the highest to date for specimens fabricated on this program. The calculated void contents were well within the 0.5-vol% range suggested by the technical monitor. The ultrasonic-absorption attenuation values, ranging from 4.3 to 6.4 db/in., which were obtained were also within the customer's suggested range. The attenuation variation was determined to be less than 1 db along the length of the cylinder; the surface reflection losses were determined to be 5.9 db. Microphotographic analysis indicated the structures to be uniform and void free. While the test results described above were excellent, the collapse pressures and the resultant stress levels were lower than expected. The highest value obtained was a pressure of 20,300 psi with a composite stress level at the ID of 112.8 ksi. All test results were below the values previously obtained for the same specimen configuration. These low values are believed to be the result of a combination of high hoop-winding tensions and the use of an internal expansion machining mandrel.

AD-605 591 Div. 26, 17
OTS Prices: HC $1.00/MF $0.50

Douglas Aircraft Co., Inc., Santa Monica, Calif.
FRACTURE STRENGTH OF ELECTRON BEAM WELDED Ti6A1-4V AND Ti-5A1-2.5Sn ALLOY SHEET AT -423F,
by E. F. Kaluza. 31 Oct 63, 19p SM-44637
Unclassified report

Descriptors: (*Titanium alloys, Welds), (*Welds, Titanium alloys), Electron beams, Sheets, Heat treatment, Tensile properties, Cryogenics, Tanks (Containers), Aluminum alloys, Vanadium alloys, Tin alloys, Microstructure, Welding, Fracture (Mechanics).

The effect of shallow cracks on the fracture strength of parent metal and electron beam welds in annealed Ti-6Al-4V and Ti-5Al-2.5Sn alloys is presented in this report. Shallow cracks of varying size were induced in parent and weld metal specimens which were subsequently tensile tested at -423F. The critical crack depth of parent metal and electron beam welded Ti-6Al-4V was found to be 0.009 inch deep. As the crack depth increased beyond 0.009 inches, the parent metal and weld metal fracture strength decreased at approximate rates of 5,300 psi per 0.001 inch and 8,700 psi per 0.001 inch, respectively. The critical crack depth of parent metal and electron beam welded Ti-5Al-2.5Sn was about 0.008 inch deep. The fracture strength of parent metal and welds decreased at an approximate rate of 6000 psi per 0.001 inch of additional crack depth. Electron beam welds appear to offer no significant improvement in fracture strength properties over TIG welds. The critical crack size and fracture strength slopes were approximately the same for either process, TIG or electron beam. (Author)

AD-605 592 Div. 26, 17
OTS Prices: HC $4.00/MF $0.75

Naval Ordnance Lab., White Oak, Md.
ULTRASONIC INSPECTION OF T-JOINT WELDS,
by R. A. Youshaw. 15 May 63, 112p
Tasks ST007 10 04, NOL 265
NOL TR63 93
Unclassified report

considerably less than that considered necessary for good resistance to brittle failure.

AD-605 288 Div. 26, 1, 17
OTS Prices: HC $8.15/MF $2.25

Republic Aviation Corp., Farmingdale, N. Y.
IMPROVED METHODS FOR THE PRODUCTION OF TITANIUM ALLOY EXTRUSIONS.
Final technical engineering rept. for 1 Jan 57-31 Oct 63, by John J. Christiana. Dec 63, 512p RAC-2571
Contract AF33 600 34098, Proj. 7 556
RTD TR63 7 556
Unclassified report

See also AD-408 203.

Descriptors: (*Titanium alloys, Extrusion), (*Material forming, Titanium alloys), Drawing (Machine processing), Hot working, Structural parts, Airframes, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Dies, Niobium alloys, Tantalium alloys, Iron alloys, Chromium alloys, Lubrication, Heat treatment, Microstructure, Surface properties, Experimental data.

A process has been developed to produce long, thin aircraft structural shapes in high-strength titanium alloys by a combination of hot extrusion and warm drawing. A variety of structural shapes such as angles, channels, zees, hats and tees were extruded in the following titanium alloys: Ti-155A, MS 821, Ti-7Al-4Mo, Ti-4Al-3Mo-1V, and Ti-6Al-4V. (Author)

AD-605 294 Div. 26, 8, 17
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
THICKNESS AND COMPOSITION OF VACUUM-DEPOSITED NICKEL-CHROMIUM FILMS,
by Isaac H. Pratt, William L. Wade, and William Weintraub. Mar 64, 44p
Proj. 1GO 24401A112 04
USAEL TR2419
Unclassified report

Descriptors: (*Metal films, Vapor plating), (*Nickel alloys, Metal films), (*Resistors, Metal films), Thickness, Vacuum apparatus, Microanalysis, Resistance (Electrical), Temperature, Stability, Distillation, Glass, Density, Weight, Vacuum, Chromium alloys.

Thin films of nickel-chromium were deposited on planar glass substrates by vacuum evaporation of the alloy 'Nichrome V' with a nominal bulk composition: Ni 80% - Cr 20%. The nickel-chromium ratio of deposited films was determined by chemical microanalysis (using spectrophotometric methods), the thickness by optical interferometry The interdependencies of thickness, composition ratio, sheet resistivity, temperature coefficient of resistance, film density, and other film parameters were investigated or derived and the interrelations of these variables are discussed. It is shown quantitatively how-under constant evaporation and deposition conditions-the nickel-chromium composition ratio varies with the sheet resistivity and how, on the other hand, the sheet resistivity varies with the thickness of these films. (Author)

AD-605 372 Div. 26, 17
OTS Prices: HC $3.00/MF $0.75

Defense Metals Information Center, Columbus, Ohio.
EXPLOSIVE FORMING OF METALS,
by D. E. Strohecker, R. J. Carlson, S. W. Porembka, Jr., and F. W. Boulger. 8 May 64, 72p DMIC-203
Contract AF33 615 1121, Proj. 8975
Unclassified report

Descriptors: (*Explosive forming, Metals), (*Metals, Explosive formings), Explosive materials, Industrial equipment, Dies, Sheets, Metal plates, Pipes, Safety, Microstructure, Mechanical properties, Stresses, Corrosion, Material forming, Manufacturing methods, Reviews.

In view of the current high level of interest in explosive metal-working processes this report has been prepared to review the status of forming materials with high explosives. The information presented has been obtained from the open literature and from firms active in this work. Explosives and their characteristics are described along with discussions of general explosive-forming techniques. More detailed treatment is given to descriptions and requirements of facilities, die designs and materials, and current applications and practice in the forming of sheet, plate, and tubular products. In addition, the response of materials to high velocity forming is described in terms of effects on microstructures, formability, and mechanical properties. Methods of determining peak pressures and energy requirements are presented in an appendix along with appropriate nomographs. (Author)

AD-605 453 Div. 26, 17
OTS Prices: HC $2.00/MF $0.50

Materials Advisory Board, NAS-NRC, Washington, D. C.
PROCEDURES FOR EVALUATING COATED REFRACTORY METAL SHEET.
3 Aug 64, 45p
Contract SD118
MAB 201M; MAB 189M, superseded
Unclassified report

Descriptors: (*Refractory metal alloys, Coatings), (*Coatings, Test methods), Sheets, Oxidation, Mechanical properties, Thickness, Transition temperature, Tensile properties, Stresses, Rupture, Creep, Fatigue (Mechanics), Temperature, Test equipment, Performance (Engineering), Microstructure.

A set of test procedures which could be used uniformly to compare coating systems is described. The intent of these procedures is to compare the oxidation resistance of coated refractory metal sheet and the effect of a coating on the mechanical properties of the sheet. Deviations from these procedures will make meaningful comparison and evaluation difficult or impossible. Therefore, deviations must be reported and justified. An important variable which significantly influences oxidation resistance and mechanical properties is coating thickness. A 'typical' coating thickness should be applied to specimens for both oxidation and mechanical property tests so that comparisons will be meaningful.

AD-605 483 Div. 26
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PLANNED REPLACEMENT ON A BUDGET,
by Sheldon James Press. Aug 64, 14p P-2965
Unclassified report

Descriptors: (*Machinery, Replacement theory), (*Replacement theory, Machinery), Probability, Mathematical analysis, Mathematical prediction, Optimization, Failure (Mechanics), Maintenance, Management engineering, Costs, Systems engineering, Equations.

inventory theory in the generally accepted meaning of the term: i.e., the analysis of problems associated with the control of stocks of physical goods at one or more locations and under various conditions.

AD-605 858 Div. 26, 13
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE CAUSES OF SYSTEMATIC ERROR IN THE COST ESTIMATES OF PUBLIC WORKS,
by R. Giquet and G. Morlat. rev. 24 Mar 58, 30p T-76
TT 64 71381

Unclassified report

Trans. of Annales des Ponts et Chaussées (France) 1952, ser. 8, v. 122, no. 5, p. 543-562.

Descriptors: (*Civil engineering, Costs), Economics, Construction, Probability, Mathematical prediction, Electric power production. France.

The cost of any single work cannot be exactly foreseen; consequently, the estimation of the cost of a series of works constituting a program appears as a random variable. Everybody admits the truth of this proposition, but financiers in general are astonished that the errors due to underestimation on the part of the engineers occur more frequently and are of greater magnitude than errors due to overestimation. Some of them impute this systematic error to a purposeful underestimation of costs, and this suspicion, tacit though it may be, contributes to embittering the relationship between financiers and engineers, to the great prejudice of the general welfare. Among reasons that have a certain explanatory value in this matter, the authors -- without pretending to exhaust the subject -- have singled out two different phenomena: (1) when it is a matter of reproducing the same work a great many times, there are reasons why the probability curve of errors affecting the estimated cost appears asymmetric; and (2) when it is a matter of a program that involves selection from among a given number of projects, and if the criterion of choice takes into account the cost of production, it appears that the error made in this estimate becomes one of the elements of choice.

AD-605 861 Div. 26
OTS Prices: HC $1.00/MF $0.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS, METALWORKING,
by T. G. Byrer, J. H. Gehrke, and F. W. Boulger.
3 Jul 64, 6p

Unclassified report

Descriptors: (*Material forming, Metals), (*Metals, Material forming), Extrusion, Steel, Titanium alloys, Vanadium alloys, Aluminum, Aluminum alloys, Hydrostatic pressure, Stainless steel, Forging, Ultrasonic radiation, Drawing (Machine processing), Rolling (Metallurgy), Copper alloys, Molybdenum alloys, Nickel alloys, Chromium alloys.

AD-605 869 Div. 26, 15
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
HELICAL PROJECTION AND ITS APPLICATION IN SOLVING GEOMETRICAL AND TECHNICAL PROBLEMS,
by A. M. Tevlin. 16 Apr 64, 20p
FTD MT63 301; TT 64 71393

Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Elektromekhanika (USSR) 1962 [v. 5] no. 2, p. 130- [140].

Descriptors: (*Projective geometry, Helixes), (*Helixes, Projective geometry), (*Geometry, Mechanical engineering), Numerical methods and procedures, Mechanical drawings, USSR.

Geometric principles are developed for a new method of curvilinear projection of space objects onto a plane in which helixes with a common axis and identical parameter are projections. The construction of helical projections of the main geometric form application of the method of helical projection in solving different geometrical and technical problems is shown. The developed method permits the obtaining of degenerate projections of helical surfaces on the horizontal or frontal plane of projections, makes possible a simple solution of problems with these surfaces, and can find use in those numerous areas of machine building where in helical surfaces are used. (Author)

AD-605 871 Div. 26
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PRECISION VOLUME STAMPING BY VIBRATION METHOD,
by M. Ya. Karnov and V. I. Vlasov. 5 Dec 63, 12p
FTD MT63 159; TT 64 71395

Unclassified report

Edited machine trans. of Mashinostroitel' (USSR) 1958, no. 6, p. 41-42.

Descriptors: (*Mechanical working, Metals), (*Forging, Vibration), (*Vibration, Forging), Presses (Machinery), Precision finishing, Heat treatment, Steel, Aluminum alloys, Structural parts, Production, Tool steel, Dies, USSR.

The article describes experimental-research work conducted by the authors on volume stamping of blanks of vanes from alloys AK6 and VD17 in a vibration press.

AD-605 890 Div. 26, 30
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
A TECHNIQUE FOR IMPROVING THE MANAGEMENT OF A COMPUTER INSTALLATION,
by R. L. Patrick. Sep 64, 74p RM-4232-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Computers, Military facilities), (*Data processing systems, Management engineering), (*Management control systems, Data processing systems), Computers, Libraries, Management planning, Computer personnel, Computer operators, Job analysis, Psychometrics, Performance (Human), Budgets, Reports, Data.

An informal technique used by computer installation managers for the control of the work force and for gathering data suitable for reports to higher management is described and documented. The purpose of the report is to make widely available to installation managers and to higher managements and command elements the details of the use of the technique, which has evolved among the more

Descriptors: (*Ultrasonic radiation, Welds), (*Welds, Non-destructive testing), (*Submarine hulls, Welds), Welding, Manufacturing methods, Steel, Carbon alloys, Nickel alloys, Chromium alloys, Molybdenum alloys, Visual inspection, Radiography.

A study was made of the ultrasonic inspection method as applied to T-joint weldments typical of submarine hull construction. This work includes the design of a new test block for instrument calibration. Commercially available equipment was used with good results. Of twenty-six locations selected for cross-sectional examination, twenty-five contained a material defect at the location indicated by ultrasonic inspection. A comparison is made between the ultrasonic, macroscopic and radiographic analyses. (Author)

AD-605 614 Div. 26, 17
OTS Prices: HC $4.00/MF $0.75

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
EXTRUDING AND DRAWING MOLYBDENUM TO COMPLEX THIN H-SECTION.
Interim technical engineering rept. no. 4, 1 May-31 Jul 64,
by P. A. Santoli. Aug 64, 117p
Contract AF33 657 11203, Proj. 8 112
RTD TR8 112 IV

Unclassified report

Descriptors: (*Molybdenum alloys, Extrusion), (*Extrusion, Molybdenum alloys), Material forming, Drawing (Machine processing), Titanium alloys, Zirconium alloys, Stainless steel, Dies, Microstructure, Surface properties, Powder alloys, Tensile properties, Ductility, Deformation, Transition temperature, Zirconium compounds, Oxides, Flame spraying, Rolling (Metallurgy), Presses (Machinery) Carbon alloys, Powder metallurgy, Beams (Structural).

Sixteen H-shaped extrustions (14 TZM and 2 stainless) were made with new support tooling. No failure or distortion occurred in the tooling, regardless of liner pressure up to 237,000 psi. Reasonable quality and dimensional runout were found in TZM extrusions at a reduction ratio of 43:1 from 3200F billet temperature with the use of flame-sprayed zirconia dies. Similar extrusions from 3350F were poor. The use of pressed and sintered solid zirconia nibs was demonstrated successfully for the extrusion of 'H' shapes. Dimensional runout for both stainless and TZM was remarkably good and liner pressures were lower than that required for extrusions with segmented, coated dies. (Author)

AD-605 637 Div. 26, 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
STRESS RISE DUE TO OFFSET WELDS IN TENSION,
by E. E. Sechler. 28 Aug 59, 26p
STL-TR-59-0000-00774, STL-EM-9-18

Unclassified report

Descriptors: (*Welds, Stresses), (*Stresses, Welds), (*Pressure vessels, Welds), Loading (Mechanics), Mathematical analysis, Tensile properties, Welding, Metal plates, Sheets, Failure (Mechanics), Ductility, Deformation.

If a butt weld in a sheet structure under tension is mismatched, an offset is produced which causes bending stresses at the weld in addition to the tensile stresses. The total stress field is calculated for the flat plate and also for a symmetrical mismatch in a cylindrical pressure vessel. (Author)

AD-605 746 Div. 26, 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON METHODS OF ANALYSIS OF SOME EXTREMAL PROBLEMS IN PLANNING PRODUCTION,
by L. V. Kantorovich. 15 Apr 58, 12p T-86
TT 64 71365

Unclassified report

Trans. of Akademiya Nauk SSSR. Doklady, 1957, v. 115, no. 3, p. 441-444.

Descriptors: (*Management planning, Mathematical analysis), (*Industrial production, Management planning), Vector analysis, Mathematical models, Matrix algebra, Set theory, Numerical analysis, Sequences, USSR.

In the investigation of questions, connected with a component of a rational plan, whose purpose is the best uses of the resources and maximum output of the required products, a method of analysis was introduced using mathematical models for the indicated problems. (Author)

AD-605 756 Div. 26, 30
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PROBLEMS OF AUTOMATING MACHINE ASSEMBLY,
by I. I. Kapustin. 27 Aug 64, 26p
FTD MT64 229; TT 64 71353

Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Mashinostroenie (USSR) 1961, no. 12, p. 64-75.

Descriptors: (*Management engineering, Automation), (*Machines, Automation), (*Construction, Automation), Performance (Engineering), Reliability, Quality control, Scientific research, Production, USSR.

An essay on the lag between scientific research and industrial application of scientific information relating to automation of machine assembly in the USSR is presented.

AD-605 843 Div. 26, 15
OTS Prices: HC $5.00/MF $1.00

RAND Corp., Santa Monica, Calif.
A REVIEW OF ALTERNATIVE APPROACHES TO INVENTORY THEORY.
Memo. rept.,
by G. Hadley and T. M. Whitin. Sep 64, 182p
RM-4185-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Inventory, Operations research), (*Stock level control, Theory), Inventory control, Inventory analysis, Management control systems, Mathematical models, Stochastic processes, Costs, Reviews.

The study surveys the current state of inventory theory, and, so far as practical application is concerned, examines the usefulness and limitations of existing theoretical results. The report does not survey the actual techniques of inventory management employed by commercial or military organizations. We restrict our attention to

27. Propulsion Systems

AD-605 138 Div. 27, 26
OTS Prices: HC $1.00/MF $0.50

Arde-Portland, Inc., Paramus, N. J.
DEVELOPMENT OF ULTRA-HIGH STRENGTH ROCKET MOTOR CASES BY CRYOGENIC STRETCH FORMING AND COOLED SOLID PROPELLANT ROCKET NOZZLES.
Progress rept. no. 7, 21 Dec 60-20 Jan 61,
by R. H. Alper. 20 Jan 61, 20p
Contract DA30 069ORD3099
Unclassified report

Descriptors: (*Rocket cases, Stretch forming), (*Rocket motor nozzles, Cooling), (*Stretch forming, Cryogenics), Pressure, Welding, Failure (Mechanics), Stainless steel, Austenite, Niobium alloys, Aluminum alloys, Rocket motors (Solid propellant), Film cooling, Coolants, Lithium, Molybdenum, Injectors, Liquid metal coolants, Sprays, Storage tanks.

This report gives an account of progress for the period December 21, 1960 to January 20, 1961. The information is presented in two (2) sections. The first section describes the work performed on Task A, Development of Ultra-High Strength Rocket Cases by Cryogenic Stretch Forming. The second section reports progress on Task B, Cooled Solid Propellant Rocket Nozzles.

AD-605 422 Div. 27, 14
OTS Prices: HC $1.00/MF $0.50

Atlantic Research Corp., Alexandria, Va.
FEASIBILITY DEMONSTRATION OF PYROLYTIC GRAPHITE COATED NOZZLES.
Quarterly progress rept. no. 2, 1 May-31 Jul 64,
by James D. Batchelor. 18 Aug 64, 25p
Contract AF04 611 9708, Proj. 3059
RPL TDR64 129
Unclassified report

Descriptors: (*Rocket motor nozzles, Coatings), (*Pyrolytic graphite, Rocket motor nozzles), (*Coatings, Rocket motor nozzles), Solid rocket propellants, Feasibility studies, Nozzle inserts, Erosion, Fracture (Mechanics), Thermal properties, Mathematical analysis, Tests, Design, Thermal insulation, Thickness. Graphite, Heat transfer.

The objective of this program is to demonstrate the feasibility of pyrolytic graphite coatings for use in uncooled solid propellant rocket nozzles under very severe operating conditions. The excellent serviceability of pyrolytic graphite coatings in 1/2-inch diameter nozzles was demonstrated in prior work with propellants having flame temperatures from 5500 to 6500F. In the current work, nozzles of 1.1-inch and 2.3-inch diameter are to be tested with a 6500F propellant. Delamination cracks in coatings deposited on the sub-scale nozzle inserts continued to be a problem. In the second sub-scale motor test, a 66-mil coating was completely removed during the 83-second firing duration. Coating failure by edge spalling was again indicated. A continuing effort is being made, including work on full-scale inserts, to eliminate the cracking problem. Stress analyses of both free-standing and composite cylinders were carried out to define the effects of geometric variables, but no stresses were found to satisfactorily explain the observed cracks. More involved stress analysis is under consideration. (Author)

AD-605 423 Div. 27, 14
OTS Prices: HC $1.00/MF $0.50

Atlantic Research Corp., Alexandria, Va.
BEHAVIOR OF NOZZLE MATERIALS UNDER EXTREME ROCKET MOTOR ENVIRONMENT.
Quarterly progress rept. no. 1, 1 May-31 Jul 64,
by J. D. Batchelor, J. B. Murphy, and E. L. Olcott.
Aug 64, 16p
Contract NOw64 0393c
Unclassified report

Descriptors: (*Rocket motor nozzles, Materials), (*Carbides, Rocket motor nozzles), (*Graphite, Rocket motor nozzles), Rocket motors (solid propellant), Heat resistant materials, Ceramic materials, Refractory metals, Chemical reactions, Thermal properties, Heat exchange, Mechanical properties, Test methods, Design, Plasma physics, Nitrogen, Hydrogen, Carbon dioxide, Erosion, Environmental tests, Test equipment.

The program is a research investigation of the behavior of rocket nozzle materials under extreme rocket motor environments. The environments of particular interest are those associated with uncooled nozzle service in advanced or future solid propellant rocket motors. Principal emphasis is placed on graphitic materials, high-melting carbides, and the most refractory metals. Chemical reactions effects of the propellant exhaust environment on these materials are studied as well as thermal and mechanical factors. Methods of reducing or controlling deleterious effects are also of interest. A plasma torch test technique which exposes the bore of a tubular specimen to a high heat flux and a high velocity of selected gas mixtures was conceived and developed.

AD-605 452 Div. 27, 9, 25
OTS Prices: HC $2.00/MF $0.50

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
ACOUSTIC LOSSES IN A RESONATOR WITH STEADY GAS FLOW.
Technical rept. no. 2.
Jun 64, 49p BBN-1142
Contract DA19 020AMC5755R
Unclassified report

Descriptors: (*Rocket motors, Acoustic properties), (*Acoustics, Rocket motor noise), Gas flow, Resonance, Attenuation, Rocket propellants, Stability, Models (Simulations).

Measurements have been made of the acoustic losses in a resonator with a small vent, and their dependence on the speed of steady flow through the system and on the position of the vent. The resonator is a closed circular cylinder, resonant in the fundamental planewave mode, with a vent through the wall near the center. Steady gas flow is introduced at one end through a slightly porous piston whose vibration also generates sound. Losses are determined from the rate of decay of pressure. Significant flow-dependent loss attributable to the vent is found for flow speeds in the vent exceeding about 0.02 times the sound speed. The loss depends on vent position. Good quantitative prediction of this loss, at flow velocities above a critical value, can be made from a theory based on the characteristics of quasi-steady fluid efflux from an orifice (total pressure quadratic in total flow). (Author)

AD-605 491 Div. 27, 10, 12, 30
OTS Prices: HC $5.00/MF $1.00

Rocketdyne, Canoga Park, Calif.

experienced managers. Five benefits of the system are described: better performance by the installation manager; a framework for measuring such performance; a base of data for planning purposes; an abstract measure of workloads for computer designers; and a codified reporting scheme so that government may learn from industry, and conversely. (Author)

AD-605 956 Div. 26, 12, 19
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A GUIDE FOR EVALUATING PRECISION GYROS FOR BALLISTIC MISSILE TYPE APPLICATIONS,
by B. H. Evans. May 60, 22p
STL/TR-60-0000-09066

Unclassified report

Descriptors: (*Quality control, Gyroscopes), (*Gyroscopes, Guided missile components), Inertial guidance, Instrumentation, Stabilized platforms, Drift, Performance (Engineering), Vibration, Acceleration, Satellites (Artificial), Guided missile trajectories, Stability, Tumbling, Test methods, Equations, Gyro stabilizers.

Production testing procedures are recommended for evaluation of precision gyros used to stabilize inertial platforms in a ballistic missile environment. It is recommended that tumbling tests be used for measurement of the drift coefficients (g-insensitive, g-sensitive, and g2-sensitive drifts); that the long-term stability of the drift coefficients be measured on sample gyros selected from the production line and on gyros recycled from systems in the field; and that by means of three cogging tests, the short-term repeatability of the drift coefficients be measured. 'Short-term' is defined for the purpose of this study as a period comparable to missile flight time. This study does not recommend usage of the 24-hour servo tests for applications of the ballistic missile type. (Author)

AD-606 053 Div. 26, 17
OTS Prices: HC $1.00/MF $0.50

Defense Metals Information Center, Columbus, Ohio.
THE PRODUCTION OF POWDER-METALLURGY TUNGSTEN SHEET AND PLATE,
by D. J. Maykuth. 20 Jul 64, 19p DMIC-M-195
Contract AF33 615 1121, Proj. 8975

Unclassified report

Descriptors: (*Tungsten, Powder metallurgy), (*Powder metallurgy, Tungsten), (*Rolling (Metallurgy), Tungsten), (*Sheets, Powder metallurgy), Metal plates, Powder metals, Impurities, Alkali metals, Silicates, Aluminum, Carbon, Sintering, Ductility, Tensile properties, Hardness, Temperature, Heat treatment.

A review and analyses is presented of the tungsten sheet rolling program performed by the Fansteel Metallurgical Corporation for the Department of the Navy. Emphasis placed on detailing the procedures which were evolved for the production of 113 plates and sheets of various gages. These materials are now being evaluated for physical and mechanical properties as well as for formability characteristics on three other current Navy programs. (Author)

AD-606 117 Div. 26
OTS Prices: HC $1.00/MF $0.50

Frebank Co., Glendale, Calif.
QUARTERLY PROGRESS REPORT, NOVEMBER 1, 1960-FEBRUARY 1, 1961. DEVELOPMENT OF A NON-MODULATING GAS PRESSURE REGULATOR AND A SNAP-ACTION RELIEF VALVE ,
by M. D. Ferguson. 1 Feb 61, 18p
Frebank-429-8-0054
Contract AF04 647 429

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Pressure regulators, Pneumatic valves), (*Safety valves, Design), Valves, Gases, Pressure, Performance (Engineering), Mechanical engineering.

The limitations of the snap action concept for pressure regulation are discussed. A possible solution is provided for a vibration resistant modulating regulator. A relief valve is developed with the excessive friction and possible setting shifts with vibration being the remaining problems.

THE ATTAINABILITY OF THE STARS,
by Eugen Sanger. 26 Sep 56, 28p T-69
TT 64 71372

Unclassified report

Die Erreichbarkeit der Fixsterne, trans. of mono. (paper) read at the International Astronautical Congress (no. 7) Rome, Sep 56.

Descriptors: (*Space propulsion, Photons), (*Space flight, Stars), (*Rockets, Velocity), Quantum mechanics, Relativity theory, Electric propulsion, Feasibility studies, Time.

The yet hypothetical quantum-rockets have jet-velocities equal to the velocity of light, so that also their flight velocities may approach the optic velocity. From the laws of classical mechanics, there would follow that the limited human life-time and the limited mass-ratio of the rocket would permit ranges of some tenths of light years, i.e., over a very limited space of our galaxy and to the very next fixed stars only. From the laws of relativistic mechanics however follows for those very near optic-velocities a considerable dilation of proper time on board of the vehicle relative to the terrestrial time, so that life of the crew and action of the rocket-motor occur slower, than would correspond to terrestrial time-scale. From this follows that within the life-span of the crew and with limited mass-ratios of the rocket, every thinkable distance in space, up to the nebulae millions of light-years distant can be covered, so that, expressed in technical terms, and from the standpoint of the crew, the vehicle seems to be able to move with considerable super optic-velocity. (Author)

AD-605 853 Div. 27
OTS Prices: HC $5.00/MF $1.00

Rocketdyne, Canoga Park, Calif.
TOTAL IMPULSE MEASURING SYSTEM FOR SOLID-PROPELLANT ROCKET ENGINE: PHASE I REPORT,
by V. C. Plane. Jun 63, 160p Rocketdyne-R-5162
Contract AF04 611 8515, Proj. 3850, Task 3850306
RPL TDR64 108

Unclassified report

Descriptors: (*Thrust, Measurement), (*Rocket motors (Solid propellant), Thrust), Site selection, Electrical equipment, Dynamics, Mathematical analysis, Design.

Discussion and results of three main considerations are presented: (1) study and discussion of the use site and existing measurement system at EAFB, with recommendations for the installation of the Rocketdyne system; (2) general and applied mathematical analyses of spring-mass total impulse measurement systems; and (3) mechanical and electrical design of the Rocketdyne system to be constructed. Specific results of these separate but related program efforts are, respectively: (1) concurrence with the general approach taken in the existing EAFB system, but disagreement with some specific design, installation, and operational features of the system; (2) new and original mathematical analyses whose results justify the Rocketdyne approach to the measurement problem; and (3) new and original mechanical and electrical component designs. (Author)

AD-605 884 Div. 27, 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TOWARD THE DESIGN OF A TURBINE WITH VARIABLE PARAMETERS AT THE INLET,
by I. S. Lyubchenko. 21 May 64, 20p
FTD MT63 294; TT 64 71408

Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Aviatsionnaya Tekhnika (USSR) 1962, v. 5, no. 4, p. 129-138.

Descriptors: (*Gas turbine blades, Design), Turbine blades, Aircraft engines, Temperature, Axial-flow turbines, Gas flow, Nozzles, Stagnation point, One-dimensional flow, Velocity, Differential equations, USSR.

The blade design for aviation turbines relating to the overall parameters at the inlet to that stage and the resulting output is discussed.

AD-605 887 Div. 27, 9
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NEWS OF SCHOOLS OF HIGHER EDUCATION, MACHINE BUILDING, 1963, NO. 1: SELECTED ARTICLES,
by V. L. Ivanov and V. S. Beknev. 6 Apr 64, 32p
FTD MT63 203; TT 64 71411

Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Mashinostroenie (USSR) 1963, no. 1, p. 97-116.

Descriptors: (*Turbine blades, Cooling), (*Axial-flow compressors, Design), Nozzles, Air cooled, Thermal properties, Fluid flow, Heat transfer, Gas turbines, Rotor blades (Turbomachinery), Reynolds number, USSR.

Contents: On the calculation of air cooling of a nozzle blade, by V. L. Ivanov; Certain features of calculation and design of axial compressors at small Reynolds numbers, by V. S. Beknev.

AD-605 986 Div. 27
OTS Prices: HC $2.00/MF$0.50

Space Technology Labs., Inc., Los Angeles, Calif.
WEIGHT AND BALANCE CONTROL DATA FOR LIQUID ROCKET PROPULSION SYSTEMS.
STL technical requirements document,
by R. D. DeLauer. 15 Nov 60, 44p
STL-T2-8(7720.6-57)

Unclassified report

Descriptors: (*Rocket motors (Liquid propellant), Data), (*Guided missile (Surface-to-surface), Propulsion), Air Force, Weight, Stability, Control, Design, Construction, Reports.

This document covers the requirements for data to be used in establishing and maintaining weight and balance control of liquid rocket propulsion systems during design and construction. (Author)

AD-606 033 Div. 27, 1, 30
OTS Prices: HC $4.00/MF $1.00

General Electric Co., West Lynn, Mass.
PROCESSING OF ENGINE DATA FOR DEVELOPMENT OF TURBOJET ENGINE ANALYZER. PART I. PROCESSING OF J79-7 ACCELERATED SERVICE AND J79-7A ENGINE DURABILITY TEST DATA.
Final rept. Part 1,
by M. E. Douglass. Aug 64, 132p
Contract AF33 657 11043, Proj. 3147, Task 314703
SEG TDR64 11 P1

Unclassified report

Descriptors: (*Turbojet engines, Performance

TOTAL IMPULSE MEASURING SYSTEM FOR SOLID-PROPELLANT ROCKET ENGINE.
Final rept.,
by V. C. Plane. Apr 64, 170p
Contract AF04 611 8515, Proj. 3850, Task 3850306
RPL TDR64 110

Unclassified report

Descriptors: (*Rocket motors (Solid propellant), Captive tests), (*Measuring devices (Electrical and Electronic), Rocket propulsion), Solid rocket propellants, Burning rate, Thrust, Measurement, Test equipment.

The culmination of all efforts in the program was the operational emplacement of a solid propellant total impulse measurement system with a total error less than 0.1% in the thrust range 1500 - 10,000 pounds and propellant burning time range 2 - 10 seconds. The achievement of this objective not only supplied the apparatus needed to obtain significant advances in the field of solid propellant performance determinations, but also clearly demonstrated that a considerable improvement is realizable in general test stand design, where accuracy of measurements is the primary concern. (Author)

AD-605 503 Div. 27, 31
OTS Prices: HC $2.00/MF $0.50

Mechanical Technology, Inc., Latham, N. Y.
EXPERIMENTAL INVESTIGATION OF A STEAM LUBRICATED JOURNAL BEARING.
Interim progress rept.,
by J. S. Meacher. 1 Aug 64, 49p MTI-64TR40
Contract Nonr3731 00FBM

Unclassified report

Descriptors: (*Journal bearings, Lubrication), (*Steam, Lubricants), Tests, Loading (Mechanics), Performance (Engineering), Gas flow.

Apparatus and preliminary testing for the experimental investigation of a steam lubricated journal bearing is described. The test bearing is an externally pressurized, double-row, orifice compensated type, 3.0 inches in diamete and 3.0 inches in length. The work is a continuation of a study of process fluid lubrication wherein the performance of a steam lubricated thrust bearing was previously investigated and reported (AD-418 416). The work is directed toward the development of process fluid lubricated bearings for shipboard application. Steam was therefore considered to be the lubricant fluid with most potential for practical application. The choice of an externally pressurized test bearing, rather than a hydrodynamic type, was based on the load capacity requirements of probable shipboard applications. Preliminary tests were conducted at room temperature and at 400F using nitrogen instead of steam as lubricant. A base line of bearing performance was thus established for comparison with future performance with steam at various conditions. (Author)

AD-605 686 Div. 27, 12
OTS Prices: HC $4.00/MF $0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
THE DYNAMICS OF ROCKET-POWERED VEHICLES,
by John A. Thorpe and Richard C. Hutchinson. Feb 59, 104p R-206
Contract AF04 647 303, Proj. 52 156

Unclassified report

Descriptors: (*Rocket propulsion, Motion), Differential equations, Coriolis effect, Vector analysis, Aerodynamic characteristics, Fuels, Sloshing, Elasticity, Fluid dynamic properties, Momentum, Rotation, Matrix algebra.

The report presents a set of differential equations describing the motion of a rocket-powered vehicle. These equations are derived from Newton's second and third laws of motion. The treatment implicitly includes the effects of aerodynamics, bending, and fuel sloshing. However, for application to particular problems, the theory of elasticity and of fluid dynamics (which can be found in standard texts) must be combined with the theory of rocket-powered motion. Also presented, in the form of appendices, is some of the mathematical background found to be useful in the derivation of the equations for rocket-powered motion. (Author)

AD-605 692 Div. 27, 10
OTS Prices: HC $1.00/MF $0.50

British Internal Combustion Engine Research Association, Ltd., Slough (England).
COMBUSTION IN DIESEL ENGINES.
A T R rept. no. 4, 1 Aug 63-31 Jul 64,
by W. P. Mansfield. 7 Sep 64, 16p
Contract DA91 591EUC2974

Unclassified report

See also AD-439 447.

Descriptors: (*Diesel engines, Combustion), (*Fuel systems, Diesel engines), Fuel injectors, Fuel sprays, Ignition lag, Fuel consumption, Performance (Engineering), Great Britain.

The report describes the effect of low compression temperatures in diesel engines with various combustion systems and some attempts that have been made to improve combustion under these conditions. (Author)

AD-605 770 Div. 27, 14
OTS Prices: HC $1.00/MF $0.50

Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT AND EVALUATION OF SOLID PROPELLANT ROCKET MOTOR CASE INSULATING MATERIALS SYSTEM.
Quarterly progress rept. no. 2, 1 Jun-31 Aug 59,
by James D. Batchelor. 15 Sep 59, 16p
Contract AF33 616 6316, Task 73500

Unclassified report

Descriptors: (*Rocket motors (Solid Propellant), Thermal insulation), (*Thermal insulation, Rocket cases), Ablation, Test methods, Thermal conductivity, Mechanical properties, Refractory materials, Impregnation, Asbestos, Phenolic plastics, Laminates, Binders, Aluminates, Epoxy plastics, Amino plastics, Silicone plastics, Furan resins, Vegetable oils, Graphite, Carbon, Silicon compounds, Carbides.

The objective of this program is to improve the capabilities of rocket motors using end-burning grains through: (1) development of laboratory test procedures to be used as criteria for the evaluation of insulating materials, and (2) development of materials for application as motor case insulation. The development of the four laboratory test proceudres has continued. In the material development phase of the program, a new evaluation series was started which will define the relative merits of several resin binder materials according to their ability to minimize heating of the substructure during ablation. A comparison will be made by subjecting panels of refractory solids impregnated with the various resins to an oxyacetylene torch test. (Author)

AD-605 792 Div. 27
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.

28. Psychology and Human Engineering

AD-605 131 Div. 28, 23
OTS Prices: HC $1.00/MF $0.50

University of Southern California, Los Angeles.
PROJECT ON APTITUDES OF HIGH-LEVEL PERSONNEL.
Final rept.,
by J. P. Guilford. 31 Dec 59, 6p
Contract N6onr23810
Unclassified report

Research on this proj. continues under Contract Nonr228 20.

Descriptors: (*Aptitude tests, Officer personnel), (*Military personnel, Aptitude tests), Reasoning, Intelligence tests, Leadership, Personality, Training, Factor analysis, Correlation techniques, Coast Guard, Marine Corps, Naval personnel.

This project sought to establish the existence of separable intellectual abilities. The typical study began with the formulation of hypotheses as to the nature of certain abilities. Known tests were used or modified, and many new tests were developed as measures of the hypothesized abilities. The resulting test battery was administered to a sample of young adult males, usually military officer candidates. The sample sizes ranged from approximately 200 to 450 for different studies. Scores from the tests were intercorrelated, and the correlations factor-analyzed. Centroid factors were rotated orthogonally to maximize simple structure, positive manifold, and psychological interpretability.

AD-605 132 Div. 28
OTS Prices: HC $1.00/MF $0.50

University of Southern California, Los Angeles.
A FACTOR-ANALYTIC APPROACH TO PROBLEM SOLVING,
by Philip R. Merrifield. 1956, 8p
Contract N6onr23810
Unclassified report

Presented at the meetings of the Western Psychological Association, Berkeley, Calif., 29-31 Mar 56.

Descriptors: (*Psychometrics, Aptitude tests), (*Decision making, Factor analysis), Learning, Reasoning, Behavior.

Certain of the complex processes referred to generically as problem solving are analyzed logically, in a manner somewhat different from the analyses of previous investigators, with the objective of relating critical phases of the process to some of the intellectual aptitudes that have been identified by factor analysis. (Author)

AD-605 147 Div. 28
OTS Prices: HC $1.00/MF $0.50

Arizona State Univ., Tempe.
OPERANT LEARNING PRINICIPLES AND COMMUNICATION.
Technical rept. no. 26,
by Arthur W. Staats. Feb 64, 18p
Contract Nonr2794 02 Unclassified report

Report on Psychological Processes in Language Communication.

Descriptors: (*Verbal behavior, Conditioned reflex), (*Learning, Verbal behavior), (*Social communication, Conditioned reflex), Stimulation, Reaction (Psychology), Motor reactions, Language, Word association, Auditory signals, Behavior, Psychometrics.

It was suggested that one type of communication may be accounted for through the application of learning principles, in this case the principles of respondent conditioning and mediated generalization. In this discussion, verbal communication is considered as the presentation of stimuli to a person, resulting in the formation of new S-R mechanisms, or the elicitation of previously acquired S-R mechanisms. Since the discussion is limited to certain types of verbal communication, either the stimulus or response involved, or both, are verbal.

AD-605 148 Div. 28
OTS Prices: HC $1.00/MF $0.50

Arizona State Univ., Tempe.
THE USE OF CHAIN SCHEDULES IN THE STUDY OF REINFORCEMENT VARIABLES IN A READING TASK.
Technical rept. no. 25,
by Arthur W. Staats, Judson R. Finley, J. Grayson Osborne, William D. Quinn, and Karl A. Minke. Jul 63, 16p
Contract Nonr2794 02
Unclassified report

Report on Psychological Processes in Language Communication, prepared in cooperation with the National Inst. of Mental Health and the Office of Vocational Rehabilitation.

Descriptors: (*Reading, Psychometrics), (*Learning, Reading), Job analysis, Analysis of variance, Scheduling, Reaction (Psychology), Performance tests, Language.

The study's purpose was two-fold: first, to establish whether the usual response characteristics associated with FR (fixed ratio) schedules would be obtained in the reading acquisition task; and, secondly, to see to what length FR responding could be carried before deterioration in performance occurred.

AD-605 149 Div. 28
OTS Prices: HC $2.00/MF $0.50

Arizona State Univ., Tempe.
A CASE IN AND A STRATEGY FOR THE EXTENSION OF LEARNING PRINCIPLES TO PROBLEMS OF HUMAN BEHAVIOR.
Technical rept. no. 24,
by Arthur W. Staats. May 63, 36p
Contract Nonr2794 02
Unclassified report

Report on Psychological Processes in Language Communication.

Descriptors: (*Reading, Psychometrics), (*Learning, Reading), Job analysis, Verbal behavior, Analysis of variance, Reaction (Psychology), Language.

A study was made on the learning principles involved in reading acquisition, with emphasis on the effect of reinforcement. An extension was made of these principles to the solution of problems of human behavior.

AD-605 150 Div. 28, 32
OTS Prices: HC $1.00/MF $0.50

Arizona State Univ., Tempe.

(Engineering)), (*Jet engines, Test methods, Thermodynamics, Degradation, Measurement, Identification, Inlet guide vanes, Combustion chamber lines, Turbines, Temperature, Pressure, Numerical methods and procedures, Graphics, Analysis, Data, Maintenance.

This report describes a method of determining the condition of jet engines through the measurement of performance sensitive parameters, and shows the results of applying the analysis techniques to data acquired during accelerated service tests of a J79-7 engine in an F104 airplane. The results of the evaluation are encouraging in that minor deteriorations not observed by either pilot or ground crew but discovered on schedule detailed inspection were properly indicate by the fault isolation techniques. More data on more engines is required to establish more clearly that the deteriorations taking place in service will be detected by thermodynamic measurements, and to define more surely the parameter limits that are indicative of deterioration requiring maintenance action. (Author)

AD-605 541 Div. 28
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PERCEPTION, COGNITION AND SCIENCE,
by Nehemiah Jordan. Sep 61, 38p P-2444
Unclassified report

Descriptors: (*Perception (Psychology), Social psychology), (*Learning, Perception (Psychology)), Psychophysiology, Sensory perception, Stimulation, Behavior, Verbal behavior, Language.

Brunswik's description of what must take place in the perceptual process is viewed as veridical in that it is independent of existing psychological theories and of epistomological postulates as to how man knows what he knows or as to what science is. Although this description may be found incorrect in the future, it is to be expected that with the increase of factual knowledge and conceptual sophistication many additional details may be added to it. The power of this description is such that it can be used to develop a chain of thought that is in many ways in opposition to Brunswik's assumptions concerning knowledge and science. Such a development is attempted in this paper.

AD-605 542 Div. 28
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
IMBALANCE IN BALANCE 'THEORY',
by Nehemiah Jordan. Nov 61, 22p P-2472
Unclassified report

Descriptors: (*Attitudes, Social psychology), (*Social psychology, Attitudes), Perception (Psychology), Behavior, Sociometrics, Language, Theory.

A discussion is presented on Heider's concept of cognitive balance. Articles reviewing the theory are examined in terms of their academic significance in the field of social psychology.

AD-605 713 Div. 28,
OTS Prices: HC $2.00/MF $0.50

Engineering Psychology Lab., Univ. of Pittsburgh, Pa.
INVESTIGATION OF MACHINE-ASSISTS TO OPERATOR PERFORMANCE: SIGNAL DETECTION AND TASK COMPLEXITY.
Final rept.,
by Richard A. Regan and Wilson A. Judd. Jan 64, 32p
Contract Nonr624 11
Unclassified report

Descriptors: (*Human engineering, Monitors), (*Visual signals, Monitors), (*Attention, Human engineering), (*Performance (Human), Tracking), Reaction (Psychology), Human engineering, Perception (Psychology), Operators (Personnel), Character recognition, Display systems, Analysis of variance, Psychomotor tests.

The initial stages of the project consisted of a review and analysis of the human engineering literature to isolate general machine-assist principles and to determine implications for application to the machine-aiding of human performance. A series of investigations was carried out in the general area of signal detection to study the facilitating properties of overt observing responses, artificial signals and display and control complexity on operator performance. The final experiment in the series was conducted to investigate the effects of task complexity on decrement over time in the performance of a signal detection task. The independent variables consisted of variation in signal rate, the number of signal sources and the complexity of the required post-detection response. Signals consisted of changes in repeatedly presented alphabetical characters. Contrary to the hypothesis suggested by previous investigations, detection performance was not significantly influenced by variations in task complexity as manipulated in this study. The results obtained are discussed in terms of arousal theory and in terms of possible performance-facilitating properties of familiar symbolic stimuli. (Author)

AD-605 752 Div. 28
OTS Prices: HC $2.00/MF $0.50

Duke Univ., Durham, N. C.
THE DECISION TO PARTICIPATE IN SMALL GROUPS EXPERIMENTS: PATTERNS OF SELF-DISCLOSURE AND THE VOLUNTEER.
Technical rept. no. 14,
by Thomas Hood. Sep 64, 26p
Contract Nonr1181 11
Unclassified report

Descriptors: (*Personality, Social psychology), (*Social psychology, Personality), Behavior, Males, Females, Psychometrics, Group dynamics, Sociometrics, Motivation, Analysis of variance.

The results of laboratory studies in social psychology are critized as unrepresentative or invalid. The first argument is that the volunteers often used are a special kind of population. Second, the volunteer is thought to have certain characteristics which interact with the variables under observation or to be an informed participant who trys to influence the results of the experiment according to his own ideas. Criswell, Riecken and Orne all note that the subject may respond to cues or other than the variables manipulated in the experiment. Orne suggests that subjects may actually strive to aid the experimenter in confirming his hypothesis. All of these observations raise doubts about the use of volunteer subjects in laboratory experiments. These doubts have led to attempts to understand the volunteering process and to attempt to discover the characteristics of volunteers. If the variables that effect volunteering are known, then measures of control can be instituted when volunteers are used in experiments. Studies suggest that unconventionality anxiety, adjustment, social extraversion, need achievement, autonomy and intelligence are related to volunteering.

AD-605 782 Div. 28
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE RESOLUTION OF COGNITIVE CONFLICT UNDER UNCERTAINTY, A CRITIQUE,
by Nehemiah Jordan. Sep 61, 6p P-2442
Unclassified report

Descriptors: (*Reviews, Decision making), (*Decision making, Experimental data), (*Reasoning, Decision making), Psychology, Scientific research.

An article appearing in the May 1961 issue of Human Relations, by Zajonc and Burnstein is reviewed. Two experiments on the resolution of cognitive conflict under uncertainty are discussed. Both experiments concern the resolution of conflicts, of discrepancies, between prior information or knowledge and new information in the form of messages. In both experiments the degree of certainty of the prior information is varied, i.e., is the independent variable.

CONDITIONED STIMULI, CONDITIONED REINFORCERS, AND WORD MEANING.
Technical rept. no. 27,
by Arthur W. Staats. Feb 64, 18p
Contract Nonr2794 02

Unclassified report

Report on Psychological Processes in Language Communication.

Descriptors: (*Conditioned reflex, Learning), (*Word association, Conditioned reflex), Verbal behavior, Language, Analysis, Reaction (Psychology).

It was suggested that some unconditioned stimuli are also primary reinforcers, or UCSR. When this is the case, the response elicited will be conditioned to any neutral stimulus with which the UCSR is paired. In that case the neutral stimulus will become a conditioned stimulus in the sense that it will now elicit the response. In addition, as a consequence of this conditioning, the neutral stimulus will acquire the reinforcement value of the UCSR, thus becoming a conditioned reinforcing stimulus. Higher-order conditioning of these eliciting and reinforcing properties can also occur from a conditioned reinforcing stimulus to a new neutral stimulus. In the area of language, extension of these principles suggests that words may become conditioned eliciting stimuli, and as a consequence will also be conditioned reinforcing stimuli. It was suggested that measures of evaluative word meaning, which have been referred to the eliciting property of words, would also give indications of reinforcing value. Several sources of empirical support for these expectations were described. (Author)

AD-605 151 Div. 28, 6
OTS Prices: HC $4.00/MF $0.75

Human Resources Research Office, George Washington Univ., Washington, D. C.
THE EFFECTS OF PAIRING, REST INTERVALS, SIGNAL RATE, AND TRANSFER CONDITIONS ON VIGILANCE PERFORMANCE.
Research memo.,
by Bruce O. Bergum and Donald J. Lehr. Mar 62, 104p

Unclassified report

Under contract with the Department of the Army.

Descriptors: (*Attention, Performance (Human)), (*Performance (Human), Analysis of variance), Job analysis, Group dynamics, Factor analysis, Personality, Scheduling, Monitors, Display systems, Signals.

Seven experiments were conducted. These included comparisons between multiple and single monitored systems; paired and isolated monitors at high and at low signal rates; spaced and massed monitoring at high and at low signal rates; a comparison between spaced, paired, and a combination of spaced and paired monitoring; and a comparison of transfer effects in going from high to low and from low to high signal rates in terms of two different displays. The results of these studies and the conclusions growing out of these results are summarized under four headings: multiple monitoring, spaced monitoring, spaced-paired monitoring, and transfer. (Author)

AD-605 243 Div. 28, 16
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INTERACTION OF SIMULTANEOUS REACTION CONDITIONS OF HUMANS,
by N. Yu. Alekseenko. 5 Aug 64, 44p
FTD TT64 282; TT 64 71295

Unclassified report

Unedited rough draft trans. of mono. Vzaimodeistvie Odnovremennykh Uspovnykh Reaktsii u Cheloveka, Moscow, 1963, p. 1-41.

Descriptors: (*Conditioned reflexes, Reaction (Psychology)), (*Reaction (Psychology), Conditioned reflexes), Reflexes, Humans, Motor reactions, Stimulation, Hands, Motion. USSR.

AD-605 387 Div. 28, 30
OTS Prices: HC $2.00/MF $0.50

Institute of Environmental Psychophysiology, Univ. of Massachusetts, Amherst.
THE EFFECT OF VARIOUS MODES OF REHEARSAL ON SHORT-TERM RECALL.
Technical rept.,
by Mary Eleanor Lewis and Warren H. Teichner.
11 Jun 64, 30p
Contract N61339 1303
NAVTRADEVCEN 1303 1

Unclassified report

Two other studies performed under this contract are 1303-2 and 1303-3, dated 11 Jun 64.

Descriptors: (*Recall, Performance tests), (*Decision making, Recall), Performance (Human), Stress (*Psychology), Vision, After-images, Memory, Character recognition, Retention, Learning, Auditory signals, Visual signals, Radar operators, Systems engineering, Weapon systems, Psychophysiology, Psychometrics.

As part of a program of study directed to improving human-data reception, processing and storage, this activity sponsored experimental research to investigate three variables: the strategies employed by human subjects; the organization of the information being communicated; and the characteristics of the display itself. This report deals with the human operation of rehearsing briefly-perceived alpha-numeric material. The results support the conclusion that, under certain conditions of task stress, appropriate rehearsal can improve that human performance which is a function of short-term memory and, thus, in a man-machine relationship, improve system performance. Suggested examples are given of the application of the findings within a military context, e.g., radar-scope monitoring within a Combat Information Center (CIC).

AD-605 417 Div. 28
OTS Prices: HC $1.00/MF $0.50

Educational Testing Service, Princeton, N. J.
JUDGMENTS OF VARIABILITY IN TWO RESPONSE MODES.
Technical rept. and research bulletin,
by Albert E. Myers. Aug 64, 10p RB-64-40
Contract Nonr2959 00

Unclassified report

Descriptors: (*Recall, Game theory), (*Decision making, Game theory), Performance (Human), Analysis of variance, Reaction (Psychology), Verbal behavior, Perception (Psychology), Social communication, Statistical analysis, Mathematical models, Correlation techniques, Social psychology.

Ss played a shuffleboard bowling game in which the variability of their performance was manipulated by E. Two response modes were used to assess the Ss' sensitivity to differences in variability: recall of individual scores and verbal report of consistency. The data supported the hypotheses that statistical tests are more sensitive to differences in variability than are the responses of Ss and that most of the individual elements in a naturally occurring distribution of variances would appear indistinguishable with respect to variability. (Author)

AD-606 136 Div. 28, 16
OTS Prices: HC $2.00/MF $0.50

Human Factors Research, Inc., Los Angeles, Calif.
ADRENALIN, NORADRENALIN AND PERFORMANCE IN A VISUAL VIGILANCE TASK,
by J. O'Hanlon, Jr. Aug 64, 36p Human-TR-750-5
Contract Nonr4120 00, Proj. NR196 035
Unclassified report

Descriptors: (*Performance (Human), Detection), (*Epinephrine, Attention), (*Levarterenol, Attention), Visual signals, Blood chemistry, Psychophysiology, Sensory perception, Cerebral cortex, Hormones, Sleep, Display systems, Reaction (Psychology), Psychometrics, Correlation techniques.

An experiment was undertaken to determine the relationship between signal detection performance and plasma concentrations of adrenalin and noradrenalin in adult male observers undertaking a visual vigilance task. Signal difficulty level was equated for each observer in a preliminary experiment and each individual was then classified as either a decrementing or non-decrementing observer on the basis of his performance on a conventional visual vigilance task. In the subsequent experiment, six decrementing and three non-decrementing observers undertook a conventional visual vigilance task. Seven other decrementing observers served as controls and viewed movies under otherwise identical conditions. Blood samples were drawn from the observers periodically during the vigilance task and these analyzed fluorometrically for adrenalin and noradrenalin. It was concluded that the level of circulating adrenalin declines in decrementing observers during a conventional vigilance task in a manner positively related to their performance on the task. The data also suggest that the amount of circulating adrenalin is differentially affected in decrementing and non-decrementing observers. (Author)

AD-605 854 Div. 28
OTS Prices: HC $1.00/MF $0.50

Florida Univ., Gainesville.
EFFECTS OF LEADERSHIP STYLE UPON GROUP PERFORMANCE AS A FUNCTION OF TASK STRUCTURE.
Technical rept. no. 3,
by Marvin E. Shaw and J. Michael Blum. Aug 64, 14p
Contract Nonr580 11, Proj. NR170 266
Unclassified report

Descriptors: (*Leadership, Group dynamics), (*Group dynamics, Leadership), Behavior, Attitudes, Personality, Verbal behavior, Performance (Human), Social communication, Sociometrics, Correlation techniques, Social psychology, Effectiveness.

Fiedler's contingency model for the prediction of leadership effectiveness holds that directive leadership is more effective when the group-task situation is either highly favorable or highly unfavorable for the leader, whereas nondirective leadership is more effective in the intermediate ranges of favorability. An experiment was conducted to test this hypothesis. Five-person groups attempted three tasks under either directive or nondirective leadership. Leadership behavior was manipulated by instructions. The three tasks were selected to vary along the Solution multiplicity dimension, hence presumed to reflect different levels of favorability for the leader. The results indicated that the directive leader was more effective than the nondirective leader only when the group-task situation was highly favorable for the leader, thus only partially supporting the hypothesis. The discrepancy between theoretical expectations and obtained results was discussed in terms of the experimental manipulations of the favorability continuum and the incompleteness of the contingency model. It was suggested that a consideration of task requirements in relation to leader behavior would add to the comprehensiveness of the model. (Author)

AD-605 855 Div. 28
OTS Prices: HC $1.00/MF $0.50

Florida Univ., Gainesville.
GROUP EFFECTIVENESS AS A FUNCTION OF GROUP MEMBER COMPATIBILITY AND COOPERATION REQUIREMENTS OF THE TASK.
Technical rept. no. 4,
by Marvin E. Shaw and Shirley A. Nickols. Aug 64, 12p
Contract Nonr580 11, Proj. NR170 266
Unclassified report

Descriptors: (*Group dynamics, Compatibility), (*Behavior, Group dynamics), Performance (Human), Personality, Effectiveness, Sociometrics, Social psychology, Correlation techniques.

This research examined the hypothesis that compatibility of group members influences group effectiveness on tasks that are high on the Cooperation requirements dimension, but has little influence on group effectiveness for tasks that are low on this dimension. Thirty groups of five persons each were assembled randomly and required to attempt two tasks, one high and one low on the Cooperation requirements dimension. Compatibility scores were computed for each group, based upon the responses of members to the FIRO-B scales. Schutz's formulas were used for this computation. Correlation coefficients were computed between compatibility scores (K, rK, oK, and xK) and measures of group behavior (time scores and questionnaire ratings). The results failed to support the hypothesis, although differences were in the expected direction. Ratings of effort expended trying to get the group to accept one's own position correlated significantly with K and with oK, suggesting that members try harder to get their views accepted in compatible than in incompatible groups. It was suggested that the relationship between compatibility and group effectiveness can be established only by selecting group members so that the total range of compatibility is represented by the sample of groups investigated. (Author)

AD-605 928 Div. 28
OTS Prices: HC $3.00/MF $0.50

Philco Corp., Palo Alto, Calif.
A HUMAN ENGINEERING EVALUATION OF SOME SELF-ILLUMINATED IN-LINE DIGITAL DISPLAYS,
by L. Shoenberger. 31 Jul 61, 52p WDL-TR1587
Contract AF04 647 532
Unclassified report

Descriptors: (*Human engineering, Display systems), (*Display systems, Human engineering), Character recognition, Reaction (Psychology), Reflexes, Performance tests, Monitors, Analysis of variance, Communication systems, Control systems, Digital systems, Visual signals.

This report describes an evaluation of six in-line self-illuminated digital displays. Based on readability, the evaluation covers a range of 117 viewing conditions of the displays. The number of correct responses that four observers made to each display was subjected to an analysis of variance and tests of significance. The conclusion of the experiment was that a character projection device was superior to the other displays over all viewing conditions, taken as a whole. (Author)

AD-605 983 Div. 28
OTS Prices: HC $3.00/MF $0.75

Institute for Mathematical Studies in the Social Sciences, Stanford Univ., Calif.
PAIRED ASSOCIATE LEARNING WITH DIFFERENTIAL REWARDS.
Technical rept. no. 66,
by Leo Keller, Michael Cole, C. J. Burke, and W. K. Estes. 20 Aug 64, 66p
Contract Nonr225 73, Grant NSF G5525
Unclassified report

Rept. in Psychology Series.

Descriptors: (*Learning, Word association), (*Word association, Conditioned reflex), Reaction (Psychology), Performance (Human), Stimulation, Retention, Psychometrics, Statistical analysis.

An attempt was made to separate the reward and information values associated with trial outcomes in a paired-associate situation. The anticipation procedure was used with a 25-item list. A trial began with a single letter appearing on a screen; then the subject made one of two available responses and received one of a unique pair of point values associated with that item. The number of points received over a series of trials was directly related to the subject's monetary payoff for participation. Two independent groups of 24 subjects were run: (1) Anon-correction group was shown only the point value associated with the response made on a trial. (2) The correction group was always shown the points corresponding to both responses. Learning curves in terms of correct responses (choices of the more favorable alternative) per trial for the correction group exhibited no significant differences among the 25 payoff combinations studied. For the noncorrection group both rates of learning and asymptotic proportions of correct responding were directly related to the difference between the two payoffs associated with an item.

30. Research and Research Equipment

AD-605 167 Div. 30
OTS Prices: HC $2.00/MF $0.50

Adaptronics, Inc., Alexandria, Va.
RESEARCH ON SYSTEMS DESIGN METHODOLOGY. VOLUME 1: LEARNING AUTOMATA DESIGN METHODOLOGY.
Final technical rept. for Apr 63-Apr 64,
by Lewey O. Gilstrap, Jr. and Roger L. Barron.
Jun 64, 26p
Contracts Nonr 4110 00, AF33 657 10734,
Proj. NR276 008

Unclassified report

Rept. is in three volumes.

Descriptors: (*Artificial intelligence, Systems engineering), (*Systems engineering, Artificial intelligence), (*Cybernetics, Systems engineering), Adaptive control systems, Learning, Automata, Bionics, Computers, Mathematical models, Operations research.

This report volume introduces a three-volume series summarizing research on systems design methodology: the approach in this work has been to emphasize detailed investigations in three areas within the general framework of adaptive systems. This volume then proceeds to discuss key concepts in the design methodology of learning automata, with consideration given to the development of adaptive systems and the use of such systems as machine aids to design. (Author)

AD-605 168 Div. 30, 15
OTS Prices: HC $3.00/MF $0.75

Adaptronics, Inc., Alexandria, Va.
RESEARCH ON SYSTEMS DESIGN METHODOLOGY. VOLUME 2: EXTENSIONS OF CLASSICAL CALCULUS OF VARIATIONS METHODOLOGY.
Final technical rept. for Apr 63-Apr 64,
by Roger L. Barron and Dora E. Kearney.
Jun 64, 94p
Contract Nonr4110 00, Proj. NR276 008

Unclassified report

Rept. is in three volumes, see also AD-605 167.

Descriptors: (*Systems engineering, Calculus of variations), (*Calculus of variations, Systems engineering), Numerical methods and procedures, Stochastic processes, Differential equations, Integral equations, Partial differential equations, Series, Operations research.

This report develops extensions of classical calculus of variations methodology to encompass a unified treatment of strong general variations within the framework of the Bolza problem. It is shown that general variations produce conditions, governing stationary solutions for the Bolza problem, which differ significantly from the results for classical 'special' variations. (Author)

AD-605 169 Div. 30, 12
OTS Prices: HC $3.00/MF $0.75

Adaptronics, Inc., Alexandria, Va.
RESEARCH ON SYSTEMS DESIGN METHODOLOGY. VOLUME 3: ADAPTIVE INFERENTIAL MEASUREMENT PROCESSES AND THEIR APPLICATION TO RE-ENTRY TRAJECTORIES.
Final technical rept. for Apr 63-Apr 64,
by Roger L. Barron, Richard F. Snyder, E. Arlin Torbett, and Robert E. J. Moddes. Jun 64, 86p
Contracts Nonr4110 00, DA36 034AMC0099Z,
Proj. NR276 008

Unclassified report

Rept. is in three volumes. See also AD-605 168.

Descriptors: (*Systems engineering, Atmosphere entry), (*Atomosphere entry, Mathematical analysis), Descent trajectories, Atmosphere, Density, Targets, Velocity, Ballistics, Perturbation theory, Mathematical models, Simulation, Computers.

A discussion of the nature of adaptive inferential measurement, the mathematics of trajectory analysis, and simulation (on a Control Data G-15 computer) of the inferential method in trajectory analysis are presented in this volume. A model and data are presented for the inferential (simultaneous) measurement of atmospheric density factor, target velocity components, and the conventional ballistic coefficient (Beta sub 0). Two new ballistic coefficients are defined as a result of the theoretical derivation of the major perturbation effects caused by object rotations during re-entry. (Author)

AD-605 219 Div. 30
OTS Prices: HC $1.25/MF $0.50

Harry Diamond Labs., Washington, D. C.
SOME METHODS OF APPROXIMATING AN OMNIDIRECTIONAL ACCELEROMETER WITH MULTIPLE UNIAXIAL ACCELEROMETERS,
by William E. Ryan. 15 Jul 64, 44p
Proj. 45900
HDL TR1243

Unclassified report

Descriptors: (*Accelerometers, Circuits), Electrical networks, Electrical properties, Mathematical analysis.

An examination is made of several methods of approximating an omnidirectional response from an array of uniaxial accelerometers. Several electronic circuits that process the output signals from the accelerometers are described. Each system is analyzed for maximum error. (Author)

AD-605 224 Div. 30, 8, 12
OTS Prices: HC $7.00/MF $1.50

Institute for Cooperative Research, Univ. of Pennsylvania, Philadelphia.
STUDY OF PIECE PART FAULT ISOLATION BY COMPUTER LOGIC. VOLUME 3. CIRCUIT ANALYSIS, SOLVABILITY AND SYSTEM STUDIES.
Final rept. for 1 Jul 62-30 Jun 64,
by C. Beckman, J. Adler, S. D. Bedrosian, R. S. Berkowitz, and T. C. Chen. 30 Jun 64, 332p
Contracts DA36 034ORD3347RD, DA36-034ORD3347A

Unclassified report

See also AD-407 823

Descriptors: (*Reliability (Electronics), Computer logic), (*Computer logic, Reliability (Electronics)), (*Checkout equipment, Guided missiles), (*Circuits, Test methods), (*Statistical analysis, Test equipment (Electronics)), Programming (Computers), Compilers, Graphics, Networks, Digital computers.

This volume is devoted to the study of circuit analysis as applied to fault isolation and system analysis. The first four chapters illustrate systematic techniques and general purpose tools for accomplishing the design

29. Quartermaster Equipment and Supplies

AD-605 216 Div. 29, 14, 26
OTS Prices: HC $0.75/MF $0.50

Rock Island Arsenal Lab., Ill.
PLASTIC FILMS: THEIR USEFULNESS IN THE FABRICATION OF TRANSPARENT BARRIER MATERIALS,
by L. W. Lynch. 25 May 64, 30p
Proj. 1A0 24401A110 05
RIAL 64 1763

Unclassified report

Descriptors: (*Plastics, Packaging), (*Packaging, Plastics), (*Films, Plastics), Cellulosic plastics, Polyvinyl chloride, Polyethylene plastics, Heat-resistant plastics, Composite materials, Rubber, Fungus deterioration, Corrosion, Storage, Stability, Tables.

Data is presented on the properties of ten recently received plastic films along with data on thirty-five films reported earlier. Fifteen films, selected from this group as representative of plastic film types, were tested for fungus resistance, corrosiveness to metals, and stability to storage at elevated temperatures. Polyvinylidene chloride, rubber hydrochloride and polyvinyl chloride were found to be corrosive; cellophane and polyvinyl chloride are not fungus resistant; cellophane, polyvinylidene chloride and rubber hydrochloride have poor stability to storage; polyethylene, and polyvinyl chloride are rated as having only fair storage stability. Recommendations are given for composite films which would result in acceptable transparent barrier materials for military packaging applications. (Author)

AD-605 304 Div. 29, 14
OTS Prices: HC $2.00/MF $0.50

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
BALLISTIC PROTECTIVE BUOYANCY MATERIALS.
Quarterly rept. no. 16, 1 Oct 63-31 Jan 64.
31 Jan 64, 40p
Contract N140 138 72793B, Proj. 4388 4

Unclassified report

See also AD-432 051.

Descriptors: (*Protective clothing, Buoyancy), (*Buoyancy, Acrylonitrile polymers), (*Acrylonitrile polymers, Buoyancy), Fibers (Synthetic), Textiles, Processing, Aging (Materials), Moistureproofing, Laundering, Life preservers, Armed forces supplies, Naval research, Ballistics, Silicone plastics, Plastic coatings.

The difficulty encountered by textile processors in the application and curing of the Decetex-104 upon the Acrilan fibers prompted the Chemstrand Company in cooperation with this laboratory to attempt the hydrophobing of the fibers during their preparation. As a result, silicone-coated staple fibers were produced and furnished to this laboratory for verification and testing. Two prototype jackets, medium and large, were tested for buoyancy. The liners were compartmented felts prepared by the American Felt Company from pre-hydrophobed 1.0 dpf Acrilan staple fibers. The medium jacket had an initial buoyancy slightly in excess of 6-1/2 lbs., and after 20 minutes of immersion dropped well below 4 lbs. However, when 1/2 lb. of the compartmented Acrylic felt was added, a remarkable increase in buoyancy was shown. A ballistic efficiency curve is also presented, representative of a needled felt containing the one denier Acrilan fibers which had been prehydrophobed. The comparison of this representative curve with previous ballistic curves for the laboratory hydrophobed Acrilan felts show that there is no essential difference in their performances.

AD-606 039 Div. 29
OTS Prices: HC $1.00/MF $0.50

Antioch Coll., Yellow Springs, Ohio.
HEIGHT-WEIGHT SIZING OF PROTECTIVE GARMENTS, BASED ON JAPANESE AIR SELF-DEFENSE FORCE PILOT DATA, WITH FIT-TEST RESULTS,
by John T. McConville, Milton Alexander, James H. Kramer, and Eugene A. Fritz. Jul 64, 50p
Contracts AF33 616 6792, AF33 657 9201, Proj. 7184, Task 718408
AMRL TDR64 66

Unclassified report

Descriptors: (*Protective clothing, Anthropometry), (*Flight clothing, Tests), Exposure suits, Pressure suits, Armed forces (Foreign), Air force, Japan, Statistical data.

The study discusses the development and test of a four-size Height-Weight sizing program of partial pressure and exposure suits designed for the Japanese Air Self-Defense Force. The sizing program is based upon an anthropometric survey of over 200 subjects, conducted at five air bases throughout Japan during the spring of 1961. The statistical rationale used in devising the Height-Weight program is presented along with the analysis of the anthropometric data. Two garments, the CSU - 7/P Partial Pressure Assembly and the CWU - 13/P Exposure Garment, were fabricated in accordance with the developed sizing program. A fit-test of these garments was conducted at Hamamatsu and Tachikawa Air Bases, Japan, in April 1963. The results of the fit-tests served to validate the soundness of the basic survey data and subsequent development of the Height-Weight sizing program. (Author)

by the Neliac-N compiler of the NAREC and has worked successfully for the following ranges of input parameters: $0 < m < 10$, $0 < l < 20$, $0 < h < 20$, $xi > 1.000005$, with a precision of at least four significant digits. (Author)

AD-605 279 Div. 30, 15, 25
OTS Prices: HC $2.00/MF $0.50

Naval Research Lab., Washington, D. C.
A NELIAC PROGRAM FOR CALCULATING SPHEROIDAL WAVE FUNCTION EIGENVALUES AND EXPANSION CONSTANTS.
Interim rept.,
by S. Hanish. 27 Jul 64, 40p
Proj. RF001 03 44 4052
NRL 6110

Unclassified report

Descriptors: (*Programming (Computers), Special functions (Mathematical)), (*Special functions (Mathematical), Programming (Computers)), (*Series, Programming (Computers)), Programming languages, Digital computers, Compilers.

A digital computer program, written in the Neliac dialect of Algol, for the computation of spheroidal wave function eigenvalues and expansion constants is presented in this report. A brief explanation of the program is made by listing all of the formulas used in its construction and by indicating in the body of the program the sets of commands corresponding to each formula in the list. The program shown has been compiled by the Neliac-N compiler on the NAREC and has worked successfully for the following ranges of input parameters: $0 < m < 10$, $0 < l < 20$, $0 < h < 20$, with a precision of at least six significant digits. (Author)

AD-605 303 Div. 30
OTS Prices: HC $1.00/MF $0.50

Northwestern Technological Inst., Evanston, Ill.
LEARNING, ADAPTATION AND CONTROL IN INFORMATION SYSTEMS.
Final summary rept. for 1 Oct 61-30 Sep 64,
by Julius T. Tou. 1 Oct 64, 12p
Contract Nonr1228 23, Proj. NR049 172

Unclassified report

Descriptors: (*Control systems, Optimization), (*Pattern recognition, Control systems), Digital computers, Data storage systems, Control sequences, Dynamic programming, Systems engineering, Equations, Theorems.

A summary report is presented on efforts devoted to system optimization via learning and adaptation, pattern identification, associative memory system, optimum control with distributed energy constraints, and general stability theory.

AD-605 311 Div. 30, 22
OTS Prices: HC $3.00/MF $0.75

Librascope Div., General Precision, Inc., Glendale, Calif.
EVALUATION OF A BUILDING-BLOCK COMPUTER SYSTEM,
by R. L. Ringo. Jun 64, 82p
Contract AF33 616 5757, Proj. 5201, Task 520117
AL TDR64 104

Unclassified report

Descriptors: (*Digital computers, Model tests), Computer storage devices, Feasibility studies, Design, Operation, Theory, Weapon systems, Airborne.

The report describes, briefly, the physical equipment and evaluation testing of an electronic digital computer fabricated to demonstrate the feasibility of the Building-Block Computing concept. In particular, the computer is a developmental test model intended for laboratory environment, bench testing. The computer consists of three general purpose Arithmetic Units, an Incremental Unit and Ancillary Equipment. The memory is a 150,000 bit magnetic drum. Solid-state circuitry is used throughout and the operating pulse rate is 166,400 pps. Power consumption is approximately 300 watts. The purpose of the evaluation was to demonstrate the feasibility of the Building-Block Computer Concept, utilizing a developmental test model of a Building-Block Computer. The conclusion is that the computing system fulfilled the design goals and successfully proved the feasibility of the Building-Block Computer Concept. (Author)

AD-605 370 Div. 30
OTS Prices: HC $2.00/MF $0.50

Rome Air Development Center, Griffiss AFB, N. Y.
A CENTRALLY CONTROLLED ITERATIVE ARRAY COMPUTER (RADCIAC),
by M. A. Knapp and D. P. Turner. Jul 64, 38p
Task DW63 2
RADC TDR64 251

Unclassified report

Descriptors: (*Computers, Iterative methods), (*Programming (Computers), Instruction manuals), Computer logic, Programming languages, Control panels.

The primary objective of the report is to provide the programming reference manual for a parallel processing computer system (Centrally Controlled Iterative Array Computer). This system is the first computer which is capable of performing one hundred simultaneous operations on different data at the same time. The parallel processing is accomplished by an array of 10 x 10 small processing modules operating under a central controller. This machine is one of the first departures from the von Neumann type conventional computer organizations. It will be available for government agencies to program, operate and experiment with parallel processing. (Author)

AD-605 371 Div. 30
OTS Prices: HC $6.00/MF $1.25

Massachusetts Inst. of Tech., Cambridge.
ADVANCED NOMOGRAPHY, NOMOGRAPHIC ELECTRONIC COMPUTATION. VOLUME 2.
Final rept.,
by Douglas P. Adams. Jun 64, 263p
Contract AF30 602 2411, Proj. 5581, Task 558109
RADC TDR62 274 V2

Unclassified report

Descriptors: (*Nomographs, Computers), (*Computers, Nomographs), Graphics, Computer storage devices, Input-output devices, Circuits, Display systems, Performance (Engineering), Feasibility studies, Correlation techniques, Design, Costs, Systems engineering, Correlation techniques.

The report shows how Nomography and Electronics can be combined to achieve Nomographic Electronic Computation. An electronic computer (identified as NOEL I for Nomographic Electronic) was designed and constructed to perform nomographic computation. Throughout the effort the choice of hardware and system configuration was evaluated in terms of expected performance figures and system cost. The report describes many approaches taken and alludes to others which were not tried due to time and funding limitations. The results obtained indicate that the

of fault isolation test procedures. Chapters 5 - 8 are illustrative examples of particular solutions of fault isolation test procedures and various types of circuits. Chapter 9 is a study devoted to statistical decision theory as applied to automatic test equipment.

AD-605 233 Div. 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio
GYROSCOPE SUSPENSION,
by E. E. Nol'skii, I. N. Pekin, and L. G. Sukovatov.
5 Aug 64, 6p
FTD TT64 446; TT 64 71285

Unclassified report

Unedited rough draft trans. of Russian patent no. 157798 (appl. no. 779649/26-10, 23 May 62).

Descriptors: (*Suspension devices, Gyroscopes), (*Gyroscopes, Suspension devices), Patents, USSR.

In the suspension described in order to reduce the force of friction and to limit the axial displacement of the gyroscope, the intermediate ring of the ball bearing is joined to a revolving holder, and the spherical face of one trunnion and a ball rest on plates of hard alloy, soldered in on two sides into a cogwheel step bearing.

AD-605 235 Div. 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
HYDRAULIC COMPUTER,
by G. S. Antonova and I. A. Khapilina. 5 Aug 64, 6p
FTD TT64 346; TT 64-71287

Unclassified report

Unedited rough draft trans. of Russian patent 154,109 (appl. 787576/26-24, 13 Jul 62).

Descriptors: (*Computers, Hydraulic systems), Pressure, Design, Operation, Patents, USSR.

A hydraulic computing device is described. For the purpose of simplification and improving the dependability, it is designed in the form of a shell into which is placed a drum with openings; there being set on the drum a loose changeable ring with openings arranged in accordance with a given program for giving out impulses into a control circuit; and, to the face of the drum there is ground in the face of a revolving disk with a vane rotor with seats, the number of which corresponds to the number of openings in the drum for fixing the position of the disk relative to the drum with the aid of a plug the piston of which serves for picking up the command pressure. (Author)

AD-605 239 Div. 30
OTS Prices: HC $3.00/MF $0.75

Office of Aerospace Research, Washington, D. C.
OAR QUARTERLY INDEX OF CURRENT RESEARCH RESULTS.
Rept. for 1 Jan-31 Mar 64.
31 Mar 64, 82p

Unclassified report

Descriptors: (*Indexes, Aeronautics), (*Air force research, Indexes), Bibliographies, Scientific research.

AD-605 240 Div. 30
OTS Prices: HC $6.00/MF $1.25

Office of Aerospace Research, Washington, D. C.
OAR CUMULATIVE INDEX OF RESEARCH RESULTS, 1963.
1963, 254p
OAR 64 5

Unclassified report

See also AD-600 160

Descriptors: (*Indexes, Aeronautics), (*Air force research, Indexes), Bibliographies, Scientific research.

AD-605 263 Div. 30, 8
OTS Prices: HC $3.00/MF $0.75

Bay State Electronics Corp., Waltham, Mass.
BS-501 HIGH-SPEED CORRELATOR.
Final rept.
Aug 64, 86p
Contract AF30 602 2915, Proj. 5534, Task 553401
RADC TDR64 158

Unclassified report

Descriptors: (*Correlators, Design), (*Special purpose computers, Correlators), Operation, Real time, Correlation techniques, Circuits, Digital computers, Acoustics.

This report describes the design and development of an experimental real time audio bandwidth (50 to 5000 cps) correlator that will display a correlogram while operating 'on line.' The correlation index is displayed as a function of relative delay and time for either auto or cross correlation. The correlogram is presented as a three-dimensional display on the CRT of a self-contained oscilloscope with the X axis presenting time, Y axis relative delay and Z (intensity) representing the correlation index. Signal input circuitry includes a normalizing (AGC) function with 40 db dynamic range along with necessary gross input level controls and metering. A five-bit A to D converter drives a re-circulating memory speedup system. Appropriate clock, accumulator, and compute circuits are used to approximate correlation coefficient at a real time rate. The output D to A converter drives the Z axis of the oscilloscope to indicate the correlation coefficient. The operating features of this device are given. (Author)

AD-605 278 Div. 30, 15, 25
OTS Prices: HC $3.00/MF $0.75

Naval Research Lab., Washington, D. C.
A NELIAC PROGRAM FOR CALCULATING PROLATE RADIAL SPHEROIDAL WAVE FUNCTIONS.
Interim rept.,
by S. Hanish. 27 Jul 64, 70p
Proj. RF001 03 44 4052
NRL 6109

Unclassified report

Descriptors: (*Programming (Computers), Special functions (Mathematical)), (*Special functions (Mathematical), Programming (Computers)), Programming languages, Digital computers, Control sequences, Compilers.

The report contains a complete transcription of a digital computer program for the computation of prolate radial spheroidal wave functions. The program is written in the Neliac dialect of Algol 60. A brief explanation of the sequence of commands is made by listing all the formulas used by the author in its construction and by indicating in the body of the program the sets of commands corresponding to each formula in the list. The program has been compiled

Descriptors: (*Control system, Synthesis), (*Flight control system, Optimization), Boundary value problems, Stochastic processes, Numerical methods and procedures, Functions, Numerical analysis.

This report is organized as follows. A general discussion of optimal control precedes a section devoted to the mathematical aspects of optimization. Stochastic problems are taken up next and this is followed by a section on two-point boundary problems. In many cases the main problem is to find an extreme value of a function of several variables. There is a section describing methods for doing this. The sections on synthesis procedures, computational studies and conclusions complete the main portion of the report.

AD-605 461 Div. 30, 27, 32
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE SOLAR SAIL AND PULVERIZED WITHOUT GRINDING,
by Yu Sun. 13 Aug 64, 12p
FTD TT64 617; TT 64 71310
Unclassified report

Edited trans. of K'o Hsueh Ta Chung (Chinese People's Republic) 1963, no. 12, p. 22-23.

Descriptors: (*Solar sails, Space propulsion), (*Fertilizers, Slags), Solar radiation, Pressure, Calcium, Material separation, China.

AD-605 481 Div. 30, 1, 26, 33
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
AN INTEGRATED APPROACH TO THE STRUCTURING OF A COST MODEL,
by L. S. Hill. Sep 64, 20p P-2921
Unclassified report

This paper was prepared as an invited contribution to the First International Meeting of the Western Section of the Operations Research Society of America, Honolulu, Hawaii, Sep 64.

Descriptors: (*Air transportation, Costs), (*Mathematical models, Air transportation), (*Airships, Air transportation), Life expectancy, Replacement theory, National defense, Defense systems, Aerodynamic configurations, Design, Test equipment, Personnel, Maintenance, Department of Defense, Operations research, Symposia.

Design decisions commonly are made today without consideration of their total economic implications. Resource requirements covering the entire life cycle of a system -- that is, from development through manufacture and operations -- frequently are treated on a fragmentary basis. Total systems costing techniques are applied too late to be included in the optimization of engineering design. Construction of a systems cost model can provide critically important data for the engineering development effort and, furthermore, serve as the framework for coordination of the entire study. A procedural approach for construction of an integrated model is outlined in this presentation. Emphasis is on an integrated approach rather than on full details of the methodology. The method of presentation is a case example, viz., the use of airships for the transportation of outsize commodities. The requirement which gave rise to the need for development of a cost model is reviewed at the outset. (Author)

AD-605 509 Div. 30
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A SMALL SCALE CONTINUOUS ACTION PNEUMATIC COMPUTER AND DELAY BLOCK,
by N. D. Lanin. 12 Aug 64, 19p
FTD TT64 523; TT 64 71324
Unclassified report

Unedited rough draft trans. of mono. Voprosy Pnevmo- i Gidroavtomatiki (Problems of Pneumatic and Hydraulic Automation) Moscow, 1960, p. 138-147.

Descriptors: (*Computers, Pneumatic devices), Models (Simulations), Reliability, Control systems, Delay circuits, Differential equations, USSR.

A description is given of continuous action pneumatic computers (PVM-2), developed at the Central Scientific Research Institute of Complex Automation (TSNIIKA) and intended for laboratory investigations of automatic control systems. The movement of the computers is described by ordinary linear differential equations with constant coefficients up to the sixth magnitude inclusive. A description is given of a differentiating link and delay block. (Author)

AD-605 518 Div. 30, 15
OTS Prices: HC $5.00/MF $1.00

Computer Sciences Lab., Northwestern Technological Inst., Evanston, Ill.
LEARNING, ADAPTATION AND CONTROL IN INFORMATION SYSTEMS; PT I,
by J. T. Tou, H. C. Hsieh, G. P. Szego, T. T. Lin, and P. P. Nuspl. Sep 64, 194p NTI-CSL-TR-106
Contract Nonr1228 23, Grant NSF G24900
Unclassified report

Descriptors: (*Computers, Control systems), Computer logic, Linear systems, Optimization, Dynamic programming, Decision theory, Digital systems, Differential equations, Relaxation oscillators, Integrals.

A study was made of optimal control in the continuous control mode and in the discrete mode. Comparisons are made between the two solutions with particular emphasis on practical implementation. The generalized quadratic performance index is used, as well as the integral of the control absolute value. Sub-optimal control in the discrete mode is investigated. Reasons for using sub-optimal control are discussed. A direct enumeration approach is used for a bang-off-bang problem. A second approach is to use a modified performance index with a smaller number of decisions. An important part of the paper is the design of a simple digital controller. This is a feasibility study and an application of computer design techniques. NAND logic and RST flip-flops are the controller modules. (Author)

AD-605 522 Div. 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
CONVERGENCE OF EXPERT CONCENSUS THROUGH FEEDBACK,
by Olaf Helmer. Sep 64, 15p P-2973
Unclassified report

Descriptors: (*Decision making, Feedback), (*Operations research, Decision making), Programming (Computers), Probability, Reliability, Control systems, Test methods, Professional personnel, Performance (Human).

concept of electronic nomography is feasible and further work is outlined which will extend the range of applicability. (Author)

AD-605 374 Div. 30, 2, 31
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
MOTION CHARACTERISTICS OF NRL PLATFORM (FORDS) IN WAVES.
Research and development rept.,
by John Foster. Aug 64, 29p
DTMB 1855

Unclassified report

Descriptors: (*Test facilities, Floats), (*Floats, Oceanographic equipment), (*Oceanographic equipment, Floats), Model tests, Test equipment, Ocean waves, Pitch (Motion), Yaw, Roll, Acoustic equipment, Transducers, Instrumentation, Frequency, Stability.

The David Taylor Model Basin was requested to make a quantitative study of the motion characteristics of the NRL Alternate 1 Stable Platform Concept (FORDS). Tests were conducted in the Seakeeping Facility on a 1/40-scale model in regular and irregular waves. In general, the motions at the light draft were comparable in magnitude to those of a cargo-type ship of the same displacement. However, at the deep or operating draft, the motion of the platform was reduced considerably. (Author)

AD-605 442 Div. 30, 18, 24
OTS Prices: HC $3.00/MF $0.75

Cornell Aeronautical Lab., Inc., Inc., Buffalo, N. Y.
APPLICATION OF PERCEPTRONS TO PHOTOINTERPRETATION.
Final rept. for 1 Jun 63-1 Jul 64,
by T. R. Babcock and G. E. Richmond. Jul 64, 92p
VE-1446-G-4
Contract Nonr3161 00

Unclassified report

See also AD-603 377.

Descriptors: (*Photointerpretation, Automatic), (*Pattern recognition, Photographs), Aerial photographs, Photographic intelligence, Photographic analysis, Band-pass filters, Spectrum analyzers, Photomultipliers, Numerical methods and procedures, Digital computers, Optical filters, Photographic images, Photographic techniques, Test methods, Lasers.

This report covers a continuing research program directed at the development of techniques for automatic recognition of features in photographs. The research emphasis was on preprocessing of original imagery to take advantage of present state-of-the-art capability in automatic pattern recognition. During the course of this period the four areas of technical concentration were (1) whole-photo classification, (2) object detection, (3) recognition, (4) system implementation.

AD-605 445 Div. 30
OTS Prices: HC $3.00/MF $0.50

George Washington Univ., Washington, D. C. School of Engineering and Applied Science.
FORECASTING THE UTILITY OF AIR FORCE APPLIED RESEARCH EFFORTS.
Master's thesis,
by Truman Lewis Griswold. Sep 64, 51p Unclassified report

Descriptors: (*Research program administration, Air force research), (*Department of Defense, Research program administration), (*Air force research, Research program administration), Scientific research, United States government, Defense systems, Decision making, Management engineering, Personnel management, Linear programming, Operations research, Budgets.

The question of how to allocate resources to research efforts is a pervasive one. Industrial enterprises, educational institutions, and government agencies are all faced with making decisions about such allocation. A moderate amount of attention has been given to the subject for application to industrial sponsorship of research; the criterion for selection of a research effort has in each case been future financial gain to the enterprise. While the criterion is an excellent one for industry, it is of no value to the planning of government-sponsored research, because financial gain is not an objective of government. There is no available measure of the utility of the results of such research (if they are achieved) before the efforts are begun. In particular, there is no measure of the relative values of individual research efforts in two or more diverse fields of research such as aerodynamics and electronics. It is to the possible means of measuring utility for proposed government-sponsored applied research that this study is directed.

AD-605 448 Div. 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE COMBOMAT,
by J. D. Madden. 28 Jun 51, 11p P-216

Unclassified report

Descriptors: (*Electronic accounting machines, Programming (Computers)), Punched cards, Computers, Data processing systems, Computer operators, Data storage systems, Control systems, Installation, Numerical analysis.

The 'combomat' is a system installed at RAND wherein persons requiring small amounts of computation may set up the work directly for an I.B.M. Card-Programmed Electronic Calculator. These persons are able to get all the information required for use of the system from a short manual in which no previous familiarity with computing machinery is assumed. The Card-Programmed Electronic Calculator setup currently in use employs an eight-place floating decimal and operates on mark sensed cards prepared by the customer. However, it is emphasized that the term, 'combomat', refers to a system rather than to a particular Card-Programmed Electronic Calculator setup and that the wiring may be as simple or as complex as the installation using the system requires. (Author)

AD-605 455 Div. 30, 1, 15
OTS Prices: HC $6.00/MF $1.25

General Precision, Inc., Tarrytown, N. Y.
A STUDY OF SYNTHESIS TECHNIQUES FOR OPTIMAL CONTROLLERS.
Final rept. for 24 Jan 62-28 Mar 63,
by B. Paiewonsky, P. Woodrow, F. Terkelsen, and J. McIntyre. Jun 64, 206p
Contract AF33 657 7781, Proj. 8219, Task 821904
ASD TDR63 239

Unclassified report

The research upon which this rept. is based was carried out by Aeronautical Research Associates of Princeton, Inc. under subcontract.

computations which might arise in the design, operation, and maintenance of a ground-based computer system. (Author)

AD-605 624 Div. 30, 8, 25
OTS Prices: HC $6.00/MF $1.25

Battelle Memorial Inst., Columbus, Ohio.
THE RELIABILITY OF ELECTRONIC COMPONENTS FOR USE IN REMINGTON RAND UNIVAC GROUND-BASED COMPUTER SYSTEMS; VOLUME IIIB: SIMULATED-USE LIFE-TEST DATA (DIODES).
Final rept. Vol. 3B, 30 Apr 56-31 Mar 58,
by J. E. Drennan, A. E. Mace, L. H. Stember, Jr., R. L. Smith, and K. E. Hassler. 31 Mar 58, 258p
Contract AF04 645 20
PB 162 511

Unclassified report

Subcontract to Remington Rand Univac, St. Paul, Minn.

Descriptors: (*Electronic equipment, Reliability, (Electronics)), (*Digital computers, Electronic equipment), (*Diodes, Digital computers), Computers, Germanium, Life expectancy, Statistical tests, Statistical data, Diodes (Semiconductor), Simulation, Test methods.

Presentation of Type HD2193 diode data for the simulated-use load-life experiment was designed to provide summarized statistics that could be used in a variety of computations which might arise in the design, operation, and maintenance of a ground-based computer system. (Author)

AD-605 625 Div. 30, 8, 25
OTS Prices: HC $5.00/MF $1.00

Battelle Memorial Inst., Columbus, Ohio.
THE RELIABILITY OF ELECTRONIC COMPONENTS FOR USE IN REMINGTON RAND UNIVAC GROUND-BASED COMPUTER SYSTEMS: VOLUME VI: PHASE III, THE DEVELOPMENT OF COMPONENT-SCREENING TECHNIQUES.
Final rept. vol. 6, 30 Apr 56-31 Mar 58,
by J. E. Drennan, W. E. Chapin, R. E. Thomas, H. M. Braner, and K. E. Hassler. 31 Mar 58, 190p
Contract AF04 645 20
PB 162 700

Unclassified report

Subcontract to Remington Rand Univac, St. Paul, Minn.

Descriptors: (*Electronic equipment, Reliability (Electronics)), (*Digital computers, Electronic equipment), (*Quality control, Electronic equipment), Computers, Transistors, Diodes, Resistors, Semiconductor devices, Life expectancy, Test methods, Mathematical prediction, Statistical analysis, Algebra, Failure (Mechanics), Stresses, Programming (Computers).

This report describes a research program directed toward the development of techniques for detecting inherently weak transistors, diodes, and resistors before they are used in the computer system. The results of this research have indicated that screening techniques based on initial parameter measurements are feasible. Trail applications of the techniques on data from exploratory and simulated-use life tests indicate that it may be possible to classify correctly as many as 80 per cent of the components destined for early failure in use. (Author)

AD-605 640 Div. 30
OTS Prices: HC $4.00/MF $0.75

Instrumentation Lab., Mass, Inst. of Tech., Cambridge.
THE EFFECT OF INCREMENT REPRESENTATION ON THE ACCURACY OF THE DIGITAL DIFFERENTIAL ANALYZER.
Master's thesis,
by Vincent Rocco DeMarco. May 58, 116p T-158
Contract NOrd17366, Proj. 53 138

Unclassified report

Descriptors: (*Digital differential analyzers, Reliability), Digital computers, Errors, Input-output devices, Programming (Computers), Servomechanisms, Control systems, Differential equations, Costs.

In the design of complex servomechanism control systems, the need for more and more accurate components arises. At present, the most important hybrid device is the Digital Differential Analyzer (DDA), for it can be made to fit stringent system requirements where analog systems are impractical, at a reasonable cost, and at a premium in size requirements. The report describes the advantages both pro and con of the DDA. It contains a numerical analysis of the present DDA techniques and a new DDA technique, the Trinary DDA. A full description on the characterization of the DDA errors and how they propagate in the solutions of differential equations are presented. Also, the logical design of the different DDA integrators are included to offer a comparison in the cost per integrator. The techniques described for the error analysis of the DDA are verified by the results of the simulation of the DDA solution of certain illustrative examples on the IBM 704. (Author)

AD-605 678 Div. 30, 12
OTS Prices: HC $2.00/MF $0.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
A LINEAR-PATH MECHANICAL ACCELERATOR,
by Kenyon L. Zapf. Feb 59, 32p R-229
Contract AF04 647 303, Proj. 52 156

Unclassified report

Descriptors: (*Acceleration, Simulators), (*Test equipment, Guided missiles), (*Guided missiles, Test equipment), Shock (Mechanics), Vibration, Models (Simulations), Performance (Engineering), Bismuth alloys, Design, Scale.

Through the combination of a torsion pendulum, a level surface, and a vertical plane, an apparatus has been devised which provides essentially sinusoidal controllable acceleration along a straight line, with minimum cross-coupling. A reduced-scale model has been built and tested and has proved such an apparatus practical. (Author)

AD-605 682 Div. 30, 2, 6
OTS Prices: HC $2.00/MF $0.50

Woods Hole Oceanographic Institution, Mass.
SWEEP SYNCHRONIZED POSITIONABLE TRIGGER AND SUPPLEMENTARY COMPONENTS,
by W. E. Witzell. May 64, 20p WHOI-Ref-64-28
Contract Nonr4029 00

Unclassified report

Descriptors: (*Echo ranging, Servomechanisms), (*Servomechanisms, Echo ranging), Recording systems, Gears, Drives, Oceanographic equipment.

The report describes the Sweep-Synchronized Positionable Trigger, together with its functions and supplementary components, as designed and built for use with the Precision Graphic Recorder (PGR) at the Woods Hole Oceanographic Institution. The positionable trigger provides a means for plotting a variable on the PGR record as a function of time, for triggering equipment such as oscilloscopes at any time, for displaying ship's heading, and for supplying, semi-automatically, ocean depth to a ship-board computer. (Author)

The research was concerned with methods of inducing a group of experts to refine their estimates of a quantity through a process of successive approximation. A technique evolved for achieving this is called the Delphi method, which involves successive questioning of the individual experts, without face-to-face confrontation, interspersed with controlled feedback of the group's opinions and of reasons offered in support of such opinions. Once a group of experts have come up with their considered 'final' estimates of a quantity, the question arises what formula should be used to combine their responses into a single quantity that may be considered their consensus. This problem was also considered, and an effort was made to get some clues as to whether the median of such responses, or possibly a suitably weighted median, might furnish the most reliable opinion consensus.

AD-605 544 Div. 30, 8
OTS Prices: HC $3.00/MF $0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
A LIMITER FOR REPETITIVE ANALOG SIMULATION. Instruction book,
Robert Bairnsfather. Mar 60, 64p E-938
Contract AF04 647 303, Proj. 52 156

Unclassified report

Descriptors: (*Analog computers, Instruction manuals), (*Limiters, Analog computers), Operation, Theory, Maintenance, Simulation, Amplifiers, Control systems, Functions, Computer operators.

A description is given of the theory, operating characteristics, and maintenance procedures of an analog Limiter for repetitive computer use. The Limiter has greater accuracy and flexibility than the earlier model. It utilizes a bridge-type diode circuit and is capable of generating the following functions: (1) Symmetric Limit with variable limits, (2) Asymmetric Limit with variable symmetry, (3) Asymmetric Limit with variable peak to peak limits, (4) Asymmetric Limit with a separately variable limit, The variation of the control dials necessary to generate these functions does not cause the output dc level to change, unless the origin is intentionally placed beyond the linear portion of the limit characteristic. Device errors are discussed and experimentally verified. The device was constructed using a standard operational amplifier similar to those in use in much of the repetitive computer. (Author)

AD-605 598 Div. 30, 17
OTS Prices: HC $0.75/MF $0.50

Rock Island Arsenal Lab., Ill.
CORRELATION OF AN ACCELERATED CONDENSATION APPARATUS WITH THE JAN-H-792 HUMIDITY CABINET, by Van Y. S. Hong and David Bootzin. 22 Jun 64, 28p
Proj. 1AO 24401A109
RIAL 64 2039

Unclassified report

Descriptors: (*Test equipment, Protective treatments), (*Corrosion inhibition, Test equipment), (*Protective treatments, Corrosion inhibition), Condensation, Humidity, Steel, Films, Laboratory equipment, Oils, Controlled atmospheres, Test methods, Oxidation, Coatings.

The correlation between an accelerated condensation apparatus and the JAN-H-792 humidity cabinet is reported. Included in this study is the employment of a test specimen which was found to be applicable to both apparatus. This test specimen interchangeability was confirmed by the results obtained relative to condensation rate, temperature differential and performance tests under controlled conditions. Comparative data on six rust preventives were obtained in the two apparatus. A statistical analysis of results indicated that the accelerated condensation apparatus is an improvement over the JAN-H-792 humidity cabinet with respect to test time and precision. Short test time is obtained by increased condensation on the test specimen and good precision is obtained by overall control of the test conditions. (Author)

AD-605 609 Div. 30, 8, 15
OTS Prices: HC $10.00/MF $3.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PROCEEDINGS OF INTERNATIONAL SYMPOSIUM ON THEORY OF RELAY SYSTEMS AND FINITE AUTOMATA. 10 Apr 64, 698p
FTD MT63 257; TT 64 71346

Unclassified report

Edited machine trans. of Mezhdunarodnaya Federatsiya po Avtomaticheskomu Upravleniyu. Trudy v. 24, n. p., 1962.

Descriptors: (*Automata, Symposia), (*Symposia, Automata), (*Computers, Symposia), Theory, Automatic, Control systems, Relays, Networks, Circuits, Mathematical models, Statistical analysis, Special functions (Mathematical), Digital computers, Computer logic, Game theory, Algebra, Linear programming, Interference, Synthesis, Electron tubes, USSR.

Questions concerning the theory of relay systems and finite automata in connection with progressive application in the technology of automatic control of discrete control systems are discussed. This theory is presented as one of the main divisions of theory of automatic control because of its own special mathematical apparatus and specific methods used in the solution of problems in its field. The symposium consisted of five sections: Abstract Theory of Automata; Probability Automata, Reliability, and Coding; Methods of Synthesis of Relay Networks; Minimization of Boolean Functions and Synthesis of Bridging Networks; and, Problems of Mechanization of Synthesis of Relay Networks.

AD-605 623 Div. 30, 8
OTS Prices: HC $8.75/MF $2.50

Battelle Memorial Inst., Columbus, Ohio.
THE RELIABILITY OF ELECTRONIC COMPONENTS FOR USE IN REMINGTON RAND UNIVAC GROUND-BASED COMPUTER SYSTEMS; VOLUME IIIA: SIMULATED-USE LIFE-TEST DATA (RESISTORS).
Final rept. vol. 3A, 30 Apr 56-31 Mar 58,
by J. E. Drennan, A. E. Mace, L. H. Stember, Jr., R. L. Smith, and K. E. Hassler. 31 Mar 58, 574p
Contract AF04 645 20
PB 162 510

Unclassified report

Subcontract to Remington Rand Univac, St. Paul, Minn.

Descriptors: (*Electronic equipment, Reliability (Electronics)), (*Digital computers, Electronic equipment), (*Resistors, Digital computers), Life expectancy, Statistical tests, Statistical data, Simulation, Carbon resistors, Computers, Test methods.

The presentation of resistor data for the simulated-use load-life experiment was designed so that it would provide summarized statistics which could be used in a variety of

offers certain clear advantages. Loops save storage space; are easier to write and debug; are easily modified to perform more or less work; and, most important, must be used in order to make our computer useful. Loops also offer the best illustration of the stored program concept: the computer can modify its own instructions during execution, and repeat them selectively.

AD-605 758 Div. 30, 5, 8
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge Corp., Inc., Los Angeles, Calif.
LINEAR SYSTEMS PERFORMANCE CRITERIA,
by A. S. Gola. 4 Jun 56, 46p
RW-GM-TM-96; RW-GM-44.3-18
Contract AF18 600 1190
Unclassified report

Descriptors: (*Linear systems, Performance (Engineering)), (*Performance (Engineering), Linear systems), Control systems, Radar equipment, Communication systems, Computers, Torque, Circuits, Electric filters, Synthesis, Checkout procedures, Statistical analysis, Functions, Matrix algebra, Transformations (Mathematics), Calculus of variations.

AD-605 772 Div. 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INTRODUCTION TO ELECTRONIC COMPUTERS. CHAPTER 4: PROGRAMMING AND CODING,
by F. J. Gruenberger and D. D. McCracken.
Oct 61, 36p P-2451
Unclassified report

Descriptors: (*Computers, Textbooks), Programming (Computers), Programming languages, Numbers, Compilers, Data storage systems, Data processing systems, Mathematics.

Coding, an activity included in programming, is introduced. This activity follows flow charting and is where the procedure defined in the flowchart is translated into a language the machine can accept.

AD-605 779 Div. 30, 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ANYONE FOR THE MOON,
by J. D. Williams. Sep 61, 12p P-2383
Unclassified report

Prepared for presentation at the Princeton University Conference, Princeton, New Jersey, 4 Oct 61.

Descriptors: (*Symposia, Lunar probes), (*Lunar probes, United States), Costs, Economics, Public opinion, Moon.

The expedition to the moon, now being attempted by the United States, is discussed. Costs are considered as well as national prestige, the benefits of scientific investigation, and the conceivable consequences of a possible failure.

AD-605 780 Div. 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
OPERATIONS USEFUL FOR SIMILARITY-INVARIANT PATTERN RECOGNITION,
by W. Doyle. Sep 61, 16p P-2449
Unclassified report

Descriptors: (*Pattern recognition, Statistical functions), (*Statistical functions, Pattern recognition), (*Artificial intelligence, Pattern recognition), Numbers, Configuration, Correlation techniques, Fourier analysis, Optical scanning, Electromagnetic waves, Filters (Electromagnetic waves), Signal-to-noise ratio.

Some ideas for position- and size-invariant two-dimensional pattern recognition are discussed. They lead, in some cases, to easily mechanized operations. An application to detection of straight lines is proposed. (Author)

AD-605 781 Div. 30, 8, 16, 32
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INFORMATION RETRIEVAL: A LOOK AT THE LOGICAL FRAMEWORK AND SOME NEW CONCEPTS,
by M. E. Maron. Oct 61, 38p P-2455
Unclassified report

Prepared for presentation at the 1961 annual Conference of the American Records Management Association held in Los Angeles, Calif., 9 Oct 61.

Descriptors: (*Information retrieval, Theory), Communication theory, Computers, Artificial intelligence, Data storage systems, Libraries, Data processing systems, Cybernetics, Simulation, Automata, Documentation, Nerve cells, Nervous system, Background.

Information retrieval is discussed and related to fields of study which have important implications for an understanding and ultimate unmasking of the problem of automatic information retrieval. These related studies are called the Information Sciences and include those sciences and techniques which have a concern for the commodity of information. How information can be measured, encoded and decoded, transmitted and stored, processed most efficiently by machine; and how it is received and processed by the human nervous system are examined under such headings as information theory, communication theory, computer switching and control theory, theory of automata and perceptrons and under the general heading of Cybernetics, which is the study of information and control in machines and men.

AD-605 783 Div. 30, 26
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SYSTEMATIC METHODS FOR PROGRAMMING SIMPLIFICATION,
by Richard L. Van Horn. Sep 61, 24p P-2447
Unclassified report

Prepared for presentation at the Electronic Business Systems Conference (5th), held in Long Beach Calif, 25-27 Oct 61.

Descriptors: (*Programming (Computers), Optimization), (*Operations research, Programming (Computers)), Data processing systems, Systems engineering, Management engineering, Programming languages, Programmers.

Programming, as used here, covers the lengthy and involved process of going from a detailed concept to an operating data system. It therefore includes analysis, development of logic charts, coding, testing, development of procedures, preparing of manuals, and other related functions. Particular attention is given to projects that are very large, involve 'new concepts,' or both.

AD-605 687 Div. 30, 12
OTS Prices: HC $2.00/MF $0.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
A LINEAR PATH MECHANICAL ACCELERATOR.
Revision no. 1,
by Kenyon L. Zapf. Mar 60, 47p IL-R-229
Contract AF04 647 303, Proj. 52 156
Unclassified report

Descriptors: (*Test equipment, Guided missiles), (*Guided missiles, Test equipment), (*Acceleration, Simulators), Shock (Mechanics), Vibration, Models (Simulation), Performance (Engineering), Bismuth alloys, Scale, Mathematical analysis.

Through the combination of a torsional vibration system, a level surface, and a tightly-stretched metal band for track alignment, an apparatus has been devised which provides low-frequency, high-amplitude, essentially sinusoidal controllable acceleration along a straight line, with minimum cross-coupling. A reduced-scale model has been built and tested and has demonstrated that a full-scale machine based on the principles outlined in this report would be practical. In testing of precision inertial components, in particular, it is desirable to have a specific force input carefully controlled to eliminate cross-acceleration; this device is suited to such a purpose. (Author)

AD-605 689 Div. 30, 9
OTS Prices: HC $1.00/MF $0.50

Atlantic Research Corp., Alexandria, Va.
DESIGN AND INSTRUMENTATION OF AN EARTH SHOCK TUBE.
Progress rept. no. 18, Oct-Nov 62,
by B. P. Polanin, L. H. Washington, and R. C. Bryant.
7 Dec 62, 6p
Contract DA36 034ORD3116RD, Projs. AD503 04 002, TB3 0112
Unclassified report

Descriptors: (*Shock tubes, Earth), Instrumentation, Design, Friction, Shock waves, Loading, Measurement.

A system to measure the friction at the sidewall of the earth shock tube has been designed. Four Baldwin-Lima-Hamilton load cells, one attached at each corner of a flange, will support the suspended shock tube, and hence will indicate the total downward force exerted on the shock tube during application of force to the soil column.

AD-605 691 Div. 30
OTS Prices: HC $1.00/MF $0.50

Princeton Univ., N. J.
AN IBM 7090-94 PROGRAM TO ANALYZE PAIRED COMPARISONS TYPE DATA COLLECTED BY A MULTIPLE RANK ORDERS DESIGN: GENERAL DESCRIPTION.
Technical rept.,
by Harold Gulliksen and Dorothy Gulliksen. Jul 64, 2p
ERP-RM-64-9
Contract Nonr1858 15; Grant NSF G3407, Proj. NR150 088
Unclassified report

Descriptors: (*Programming (Computers), Data), Statistical analysis, Least squares method, Punched cards, Input-output devices, Transformations (Mathematics), Programming languages, Computers, Tapes.

An IBM 7090-94 program was developed for analysis of paired comparisons type data collected by a multiple rank orders design. This program utilizes input data from questionnaires of thirteen different designs, from a 7-7-3 design (7 stimuli in 7 blocks of 3 each) to an 81-90-9 design, (81 stimuli in 90 blocks of 9 each). A checking program is included with an output identifying certain types of errors. The output of the analysis program gives: (1) Individual output with information on each subject as follows: (a) the 'votes for' score of each subject for each stimulus in the questionnaire; (b) the number of stimuli not favored and the number favored in the Absolute Judgment section; and (c) the total circular triads (TCT) for each individual both before and after including the absolute judgments. (2) A group output with (a) the paired comparisons matrix for all subjects and all stimuli, and (b) scale values determined from this matrix. (Author)

AD-605 701 Div. 30, 14, 17
OTS Prices: HC $3.00/MF $0.50

Research, Inc., Hopkins, Minn.
DEVELOPMENT OF A COMBINATION SPECTRA LOADING FATIGUE AND DYNAMIC HEATING SYSTEM FOR DETERMINATION OF COMPLEX LOAD-TEMPERATURE-TIME DESIGN DATA OF MATERIALS.
Rept. for 15 Apr 61-15 Oct 63,
by Robert W. Churchill. Apr 64, 52p
Contract AF33 616 8124, Proj. 7381, Task 738103
RTD TDR63 4234
Unclassified report

Descriptors: (*Loading (Mechanics), Test equipment), (*Materials, Test equipment), (*Test equipment, Materials), (*Laboratory equipment, Materials), Fatigue (Mechanics), Laboratory furnaces, Infrared equipment, Servomechanisms, High-temperature research, Temperature control, Compressive properties, Tensile properties, Automatic, Airborne, Test methods, Weapon systems, Dynamics, Statics.

This program involved the modification of a standard dynamic loading test machine, the addition of a high rate heating oven and the development of an automatic programmer for both items. This test equipment is capable of programming slowly varying static loads, dynamic loads, and temperature, automatically through the use of arbitrary programs drawn on a curve following programmer. Three programs are included: one for the upper load, one for the lower load and a third for specimen temperature. The machine is capable of operating at speeds up to 5000 cpm, and is capable of applying one cycle at a time and holding a load during programmed temperature fluctuations. The dual-elliptical-reflector infrared furnace is capable of applying specimen transient temperatures up to 3000F and continuous temperature of 1800F. The maximum combined load that can be applied to a test specimen is 13,227 pounds tension or compression. The maximum static load is 7,936 pounds. The maximum high frequency load is ±551.15 pounds to ± 6613 pounds and the maximum slow speed force (up to 40 cpm) is ± 11, 023 pounds. A detailed description of the test equipment and its operation are given in this report. (Author)

AD-605 738 Div. 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INTRODUCTION TO ELECTRONIC COMPUTERS. CHAPTER 5: LOOPING,
by F. J. Gruenberger and D. D. McCracken. Oct 61,
28p P-2465
Unclassified report

Descriptors: (*Computers, Textbooks), Programming (Computers), Compilers, Coding, Data storage systems, Control sequences, Data processing systems.

Looping, which is a basic tool in programming and coding,

systems. The Round-Robin is very complex in all its generality, however with the aid of a realistic simplifying assumption the desired expected waits were calculated. The Round-Robin under worst conditions (i.e. 'full load') was analysed rigorously. The Dynamic-Priority Multiple-Level System considered was slightly different from the one implemented by Prof. Corbato of M. I. T. Here again results were complex in general, but were derived generally nevertheless. Specialization of these results should simplify them somewhat. (Author)

AD-605 846 Div. 30, 9
OTS Prices: HC $4.00/MF $0.75

Princeton Univ., N. J.
AN ELECTROMAGNETIC SUSPENSION SYSTEM FOR SPHERICAL MODELS IN A HYPERSONIC WIND TUNNEL,
by R. N. Zapata and T. Dukes. Jul 64, 104p AER-682
Contract Nonr1858 37, Proj. NR061 136
Unclassified report

Descriptors: (*Electromagnets, Suspension devices), (*Suspension devices, Hypersonic wind tunnels), (*Hypersonic wind tunnels, Suspension devices), Wind tunnel models, Spheres, Electromagnetism, Magnetic fields, Control systems, Feedback, Hypersonic flow, Three-dimensional flow, Instrumentation, Optical equipment, Helium, Stabilization systems.

The design of an electromagnetic balance for suspending spherical models in a hypersonic wind tunnel is described. An orthogonal force system, together with compensated optical sensors in three stabilizing automatic feedback loops, provides inherently uncoupled control in three degrees of freedom. The major parts of the report contain the designs of the electromagnetic coil configuration and of the feedback loops. (Author)

AD-605 927 Div. 30
OTS Prices: HC $3.00/MF $0.75

Coordinated Science Lab., Univ. of Illinois, Urbana.
THE LOGIC ORGANIZER AND DIAGNOSIS PROGRAMS,
by Sundaram Seshu. Jul 64, 93p CSL-R-226
Contracts DA28 043AMC00073E, AF49 638 1383
Unclassified report

Descriptors: (*Computer logic, Digital computers), (*Programming (Computers), Instruction manuals), Switching circuits, Sequence switches, Input-output devices, Computer personnel, Programming languages, Analysis, Control.

The first part of the report is a user's manual for those wishing to use the system of programs for the diagnosis of sequential switching circuits. The second part is a programmer's manual. Detailed descriptions of the individual sub-routines, including calling sequences and peculiarities are given. This system of programs was developed as a tool in the experimental study of self-diagnosis in electronic digital computers. The system consists of two programs--the organizer (5000 instructions) and the sequential circuit analyzer (10,000 instructions) with about 1500 instructions in common. The organizer is a program for arranging the logic in levels and identifying any feedback loops not identified in the input. The sequential circuit analyzer is a program for producing the testing procedure for any given sequential circuit. The organizer prepares the input for the analyzer. The entire system is written in machine language for the CDC 1604 computer and uses the Illinois system subroutines for input-output. (Author)

AD-605 954 Div. 30, 8, 25
OTS Prices: HC $1.00/MF $0.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 2. SYSTEMS.
Quarterly progress rept. for 15 Aug-15 Nov 62.
15 Nov 62, 12p
Contract AF19 628 500
Unclassified report

Descriptors: (*Digital systems, Design), (*Communication theory, Electronics), (*Optics, Infrared research), Communication systems, Radar, Data processing systems, Data transmission systems, Demodulation, Plasma physics, Crystallography, Propagation.

Quarterly progress results are presented in the fields of systems analysis, communications, and optics and infrared research.

AD-605 955 Div. 30, 7, 8
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
RATE DIAGRAM METHOD OF ANALYSIS OF AN ON-OFF CONTROL SYSTEM,
by Harry Patapoff. Jul 60, 14p
STL/TR-60-0000-19323
Unclassified report

Descriptors: (*Control systems, Graphics), (*Graphics, Control systems), (*Switching circuits, Control systems), Nonlinear systems, Dynamics, Stability, Transients, Functions, Mathematical analysis.

The development of a technique is described in which the performance of a class of on-off control systems can be analyzed by means of a 'rate diagram'. Such a diagram is a plot of the controlled element output rate at control removal versus the rate at control application. Information regarding system stability, transient response, limit cycles, and duty cycles can readily be obtained directly from the rate diagram. This method can be effectively used as a design tool in optimizing systems to meet specified performance requirements. (Author)

AD-605 964 Div. 30, 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica.
SET-THEORETIC FORMALIZATIONS OF COMPUTATIONAL ALGORITHMS, COMPUTABLE FUNCTIONS, AND GENERAL-PURPOSE COMPUTERS,
by Roger E. Levien. Apr 62, 36p P-2573
Unclassified report

Paper prepared in cooperation with the National Science Foundation for presentation at Polytechnic Symposium on the Mathematical Theory of Automata, New York, 24-26 April 1962.

Descriptors: (*Computers, Operation), Functions, Set theory, Theorems, Mathematical analysis.

The paper is concerned with formalization of the notion of computational algorithm, determination of the class of functions computable by such algorithms, and development of a formal definition of 'general-purpose computer'. Functional systems, consisting of a set and a function in that set, were introduced and two definitions according to which they may be considered to compute functions were proposed. It was demonstrated that under the first, and more elementary, definition of the function computed by functional systems, a vanishingly small fraction of all functions, only the class of stable functions, is computable. The existence of single functional systems which can compute every function in a given set was demonstrated.

AD-605 787 Div. 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INTRODUCTION TO ELECTRONIC COMPUTERS. CHAPTER 3: FLOWCHARTING,
by F. J. Gruenberger and D. D. McCracken. Oct 61, 18p P-2443

Unclassified report

Descriptors: (*Computers, Textbooks), Programming (Computers), Coding, Compilers, Data processing systems.

Three main reasons for drawing flowcharts are discussed: a flowchart lays out pictorially the logic of the problem solution; the flowchart breaks up the solution into small pieces, each of which is easy to work with; and a flowchart is an excellent means of communication.

AD-605 788 Div. 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INTRODUCTION TO ELECTRONIC COMPUTERS, CHAPTER I: INTRODUCTION TO COMPUTERS,
by F. J. Gruenberger and D. D. McCracken.
1 Mar 61, rev. 10 Aug 61, 16p P-2231-1

Unclassified report

Descriptors: (*Computers, Textbooks), Programming (Computers), Data processing systems, Data storage systems, Control sequences, Compilers, Digital computers, Background.

An electronic computer, a device which can accept information, store it, process it, and present the results of the processing in some acceptable form is introduced.

AD-605 789 Div. 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
INTRODUCTION TO ELECTRONIC COMPUTERS. CHAPTER 2: THE ORGANIZATION OF THE COMPUTER,
by F. J. Gruenberger and D. D. McCracken. 8 Sep 61, 20p P-2440

Unclassified report

Descriptors: (*Computers, Textbooks), Data storage systems, Numbers, Compilers, Control sequences, Data processing systems, Programming (Computers), Operation.

This paper discusses the following fundamentals of the electronic computer; characteristics of storage, pattern of the computer, the computer instruction, the operands of an instruction, the computer's cycle of operations, types of addressing, and loading storage.

AD-605 806 Div. 30, 15
OTS Prices: HC $4.00/MF $0.75

Stanford Research Inst., Menlo Park, Calif.
APPLICATION OF QUEUING THEORY TO INFORMATION SYSTEMS DESIGN.
Final rept.,
by David Nee. Jun 64, 122p
Contract AF19 628 2901, Proj. 4513
ESD TDR64 428

Unclassified report

Descriptors: (*Queueing theory, Information retrieval), (*Information retrieval, Queueing theory), Models (Simulation), Design, Statistical analysis, Operations research, Probability.

This research project was undertaken to investigate the application of queuing theory, in particular the priority queuing theory, to structuring of information systems. A scheme of classifying queuing models and queuing literature was developed, and was used to classify most of the known priority-queuing literature. The waiting-time distribution for a multi-server, head-of-the-line, priority-queuing model was developed. Priority-queuing formulas were catalogued and listed in accordance with the classification scheme. A simple single-stage priority-queuing model was constructed to demonstrate the feasibility of using such a model to augment the analytical modeling techniques in investigating more complex priority-queuing systems. Finally, procedures for the application of the queuing model to structuring of information systems were outlined. (Author)

AD-605 824 Div. 30
OTS Prices: HC $1.00/MF $0.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE SOFTWARE PROBLEM.
Group rept.,
by D. B. Yntema. 4 Sep 64, 20p LL-1964-51
Contract AF19 628 500
ESD TDR64 370

Unclassified report

Descriptors: (*Digital computers, Systems engineering), (*Programming (Computers), Digital computers), Computer personnel, Engineering personnel, Labor, Design.

The question of making digital computers more useful to technical personnel like engineers and scientists is discussed informally. It is suggested that computing systems should be designed for a type of use described as 'step-display-look.' It is also suggested that once the user has been put on-line, the problem of software becomes critical. In particular, the clerical labor that is usually required in instructing the computer becomes an important obstacle to rapid interaction between man and machine. The requirements for an experimental system intended to put these opinions into practice are sketched, and some of the major decisions that have been made in planning such a system are discussed briefly. (Author)

AD-605 825 Div. 30, 15
OTS Prices: HC $3.00/MF $0.50

Operations Research Center, Mass. Inst. of Tech., Cambridge.
A MATHEMATICAL ANALYSIS OF COMPUTER TIME-SHARING SYSTEMS.
Interim technical rept. no. 20 (master's thesis),
by Nitin Ratilal Patel. Jul 64, 55p
Contract Nonr4102 01; Grant DA ARO D31 124G158
AROD 968 37

Unclassified report

Report on Fundamental Investigations in Methods of Operations Research, Rept. on Proj. MAC.

Descriptors: (*Computers, Scheduling), (*Scheduling, Computers), Real time, Time studies, Operations research, Management engineering, Mathematical analysis.

Two important and popular time-sharing systems were analysed for the expected waits of requests. These were the Round-Robin and the Dynamic-Priority Multiple-Level

31. Ships and Marine Equipment

AD-605 160 Div. 31, 9
OTS Prices: HC $3.00/MF $0.75

Institute of Engineering Research, Univ. of California, Berkeley.
EXPERIMENT DATA FOR TWO SHIPS OF 'MINIMUM' RESISTANCE,
by Wen-Chin Lin, J. Randolph Paulling, and J. V. Wehausen. Aug 64, 62p NA-64-8
Contract Nonr3656 17

Unclassified report

Descriptors: (*Ship models, Experimental data), (*Fluid dynamic properties, Ship models), Ships, Design, Ship hulls, Hydrodynamics, Numerical analysis, Taylor's series, Optimization, Fourier analysis, Series, Model tests.

This report presents the results of towing-tank tests carried out on two of the models of minimum 'total' resistance described in an earlier report by Lin, Webster and Wehausen (1963) (AD-417 630). One model was symmetric fore and aft, the other asymmetric with a prescribed afterbody. Each was supposed to be optimum within its class for a Froude number 0.316 and a Reynolds number 1.18 x 10 to the 9th power. Although the forms showed resistance qualities near the design speed as good as the equivalent forms for Taylor's Standard Series, they were not significantly better. The occurrence of separation behind the stern bulb of the symmetric model may have masked possible superior wave-making qualities as indicated by a rather small surface disturbance. (Author)

AD-605 177 • Div. 31
OTS Prices: HC $7.00/MF $1.50

Aerojet-General Corp., Azusa, Calif.
HYDRODYNAMIC CHARACTERISTICS OF BASE-VENTED AND SUPERCAVITATING STRUTS FOR HYDROFOIL SHIPS. VOLUME I. TEXT AND APPENDIXES.
Final rept. for Jun 61-Dec 63,
by E. R. Bate, M. Bielecki, J. T. Byrne, S. Davis, and H. F. Gaebler. Aug 64, 324p AGC-2796, v. 1
Contract NObs84664

Unclassified report

Descriptors: (*Hydrofoil boats, Supports), (*Supports, Design), Marine rudders, Drag, Yaw, Geometry, Models (Simulations).

The experimental program consisted of two phases: a basic strut investigation, and a study of the effect of rudders on a selected strut. The basic strut investigation consisted of (1) exploratory tests in which the experimental techniques and equipment were checked out, and a comparison made of results obtained with a straight model and with a model curved to the towing radius; (2) a study of drag optimization of basic sections; (3) cross force and yaw moment studies; (4) an evaluation of the effect of strut geometry (thickness ratio and rake); and (5) a study of the effect of scale (size and speed) as represented by Froude number. The rudder study was concerned with the effect of rudder geometry (i.e., chord ratio, span ratio, and spanwise location of the rudder) on a selected strut section.

AD-605 178 Div. 31
OTS Prices: HC $7.40/MF $2.00

Aerojet-General Corp., Azusa, Calif.
HYDRODYNAMIC CHARACTERISTICS OF BASE-VENTED AND SUPERCAVITATING STRUTS FOR HYDROFOIL SHIPS. VOLUME II. ILLUSTRATIONS.
Final rept., vol. 2, Jun 61-Dec 63,
by E. R. Bate, M. Bielecki, J. T. Byrne, S. Davis, and H. F. Gaebler. Aug 64, 440p AGC-2796, v. 2
Contract NObs 84664

Unclassified report

See also AD-605 177.

Descriptors: (*Hydrofoil boats, Supports), (*Supports, Design), Marine rudders, Models (Simulations), Graphics, Photographs.

AD-605 194 Div. 31, 30
OTS Prices: HC $1.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
POWERING CHARACTERISTICS OF TWO V-BOW VARIATIONS FOR SERIES 60, 0.60 C sub B MODELS, TMB MODEL 4969 AND UM MODEL 924,
by A. H. Weaver, Jr. Jul 64, 22p
DTMB 1812

Unclassified report

Descriptors: (*Shyr models, Propulsion), Shyr hulls, Design, Marine surface propulsion, Propellers (Marine), Model tests, Hydrodynamic configurations, Power, Velocity, Thrust.

This report presents powering characteristics as predicted from tests with two V-bow variations of Series 60, 0.60 C sub B models, TMB Model 4969 and UM Model 924, and compares them with the powering characteristics of the parent form, TMB Model 4210. The test results showed excellent agreement in rpm, thrust deduction and thrust wake. (Author)

AD-605 226 Div. 31
OTS Prices: HC $2.00/MF $0.50

Hydronautics, Inc., Laurel, Md.
THE DESIGN OF BASE-VENTED STRUTS FOR HIGH SPEED HYDROFOIL SYSTEMS,
by V. E. Johnson, Jr., and S. E. Starley. Sep 62, 28p
Hydro-TR 001-16
Contract NObs78396, Proj. S F013 0201

Unclassified report

Paper reprinted from the IAS/Navy Meeting on Hydrofoils and Air Cushion Vehicles, Washington, D. C. 17-18 Sep 62.

Descriptors: (*Hydrofoil boats, Supports), (*Supports, Design), Ship structural components, Drag, Cavitation, Thickness, Mathematical analysis, Theory.

Several families of two dimensional base vented struts with low cavity drag are derived and the important characteristics of these struts such as incipient cavitation number, section modulus and drag at finite base cavitation number are presented. A comparison of these theoretical results with limited experimental data show the theory to be adequate. The practical problem of designing optimum base vented struts for prescribed thickness or section modulus including the influence skin friction, strut weight, and the use of 'built-up' or hollow construction is also discussed. (Author)

AD-605 290 Div. 31
OTS Prices: HC $1.00/MF $0.50

David Taylor Model Basin, Washington, D. C.

AD-605 988 Div. 30, 2, 20
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs Inc., Los Angeles, Calif.
ANALYSIS OF THE MOON'S SURFACE BY NUCLEAR REACTIONS,
by E. F. Martina and Carlton D. Schrader. 5 Apr 60, 34p STL/TR-60-0000-00078, UCRL-5916
Unclassified report

Prepared in cooperation with Lawrence Radiation Lab., Univ. of California, Livermore.

Descriptors: (*Moon, Chemical properties), (*Lunar environment, Radioactivation analysis), (*Radioactivation analysis, Moon), Lunar probes, Nuclear reactions, Neutron beams, Neutron reactions, Mass-energy relation, Albedo, Beta decay, Gamma emission, Inelastic scattering, Proton bombardment, Gamma ray spectra, Radiation measurement systems, Astrophysics, Theory.

Several methods of determining the elemental composition of the moon's surface are discussed, assuming an un-manned, non-destructive lunar landing. The general approach considers bombardment of the surface with various nuclear beams and examines the possible nuclear reactions which are known to be dependent on the mass, charge or energy level structure of the irradiated material. The resultant radiations are sought which can be detected with little-or-no loss or distortion of the information which they contain. Various detectors and accelerators as well as lunar and interplanetary backgrounds are also considered. Detection and pulse height analysis of gamma rays produced by the bombarding beam is the method of greatest promise. Two separate experimental designs, one involving an incident 14 Mev neutron beam, and the other involving an incident 14 Mev proton beam, are discussed in detail.

AD-605 998 Div. 30, 8, 12
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
ENVIRONMENTAL TEST PROGRAM FOR AIRBORNE ELECTRONIC EQUIPMENT,
by L. K. Lee and S. C. Morrison. 3 Sep 57, 19p
GM-43.2-211
Unclassified report

Descriptors: (*Electronic equipment, Environmental tests), (*Environmental tests, Electronic equipment), Test methods, Reliability (Electronics), Airborne, Guided missile components, Quality control, Sampling, Standards, Design.

This document provides a guide for conduct of environmental test programs to optimize the performance and reliability of airborne electronic parts, assemblies, and equipments. Program needs are outlined. The parts testing program is examined in terms of such factors as experience with parts, part criticality, frequency of occurrence, cost, and reliability objectives.

AD-606 119 Div. 30, 16
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
LOGICAL TECHNIQUES FOR GLOTTAL SOURCE MEASUREMENTS.
Instrumentation papers,
by John L. Ramsey. Aug 64, 17p
Proj. 5628
AFCRL 64 661; AFCRL IP48
Unclassified report

Descriptors: (*Speech, Scientific research), (*Speech representation, Data processing systems), (*Data processing systems, Speech representation), Motion pictures, Sound signals, Images, Microphones, Input-output devices, Physiology, Magnetic tape, Time, Anatomical models, Data storage systems.

This report describes a method of using a PDP-1 computer to reduce data from a very high speed motion picture that shows the human vocal cords during voicing and carries a visual representation of the electrical signal from a microphone held in front of the subject during the filming. The object is to get representations of the area of the glottis (the opening between the vocal cords) and the pressure amplitude of the acoustical signal as functions of time. The glottal area and the acoustical amplitude shown on each frame of the film are reduced to binary form and stored on magnetic tape, together with a set of coordinates representing the periphery of the glottis, all suitably identified. Each frame of the film constitutes a sample in time which is not uniform because of slight changes in camera speed. A second program interpolates the data to yield uniform samples in time, normalized and properly scaled for presentation on the computer scope. The two functions are also synchronized in time and punched out on paper tape. A third program displays the data from the paper tape as two curves, one above the other, which drift slowly across the scope face. New data is added and old data discarded so that the drift is forward in time. The drifting can be stopped and specific parts of either wave can be designated with the light pen for more detailed examination. (Author)

AD-606 130 Div. 30, 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
PARAMETRIC STUDY OF THE CONICAL SHOCK TUBE,
by Vernal Josephson and Richard W. Hales.
1 Mar 60, 28p STL/TR-60-0000-09048
Contract AF04 647 309
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Shock tubes, Design), Conical nozzles, Electromechanical converters, Performance (Engineering), Shock waves, Propagation, High-pressure research.

A parametric study was made on the performance of a conical discharge shock generator. From these studies it was possible to formulate general ground rules to be followed in designing a shock tube of this type capable of producing a single high velocity shock at gas pressures varying from 25 - 2000 micron. Typically, shocks of M sub s - 150 were produced in D sub 2 at 100 micron pressure. (Author)

equation is based on the lateral forces used to determine the motions. A computer program, which permits changes in the theory to be made easily, is then prepared to carry out the calculations.

AD-605 516 Div. 31, 9
OTS Prices: HC $3.00/MF $0.75

David Taylor Model Basin, Washington, D. C.
WIND-TUNNEL TESTS TO DETERMINE AERODYNAMIC FORCES AND MOMENTS ON SHIPS AT ZERO HEEL,
by G. R. Mutimer. Mar 55, 64p
DTMB 956; DTMB Aero 27

Unclassified report

Descriptors: (*Ship models, Force (Mechanics)), Aerodynamic characteristics, Moments, Stability, Wind tunnels, Ships.

Compilation of data on 9 ship models obtained from various tests made in TMB tunnels over the period 1948-1953. Water-line models were used. These ships were United States, Old Colony Mariner, LST 1156, Pennsylvania, DD692, Roanoke, Salem, CV9, and YTB500. (Author)

AD-605 525 Div. 31, 9
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
A DESIGN APPROACH TO THE PROBLEM OF CRITICAL WHIRLING SPEEDS OF SHAFT-DISK SYSTEMS,
by Norman H. Jasper. Dec 54, 38p
DTMB 890

Unclassified report

Descriptors: (*Propellers (Marine), Vibration), (*Shafts, Design), Crankshafts, Supports, Resonance, Rotation, Bearings, Tolerances (Mechanics), Models (Simulations), Failure (Mechanics), Velocity, Mathematical analysis, Equations, Marine engineering, Design, Hydrodynamics.

The problem of resonant whirling of propeller-shaft systems is discussed with special emphasis on those factors determining the critical speeds. Several methods for computing the natural whirling frequencies of propeller-shaft systems are presented and discussed. Among these methods are approximate formulas for the fundamental natural whirling frequency which are suitable for direct application by the shaft designer. Computed and experimentally determined natural frequencies are compared. The possible forced whirling motions due to hydrodynamic forces acting on the propeller are discussed. (Author)

AD-605 535 Div. 31
OTS Prices: HC $2.00/MF $0.50

Lessells and Associates, Inc., Waltham, Mass.
RESULTS FROM FULL-SCALE MEASUREMENTS OF MIDSHIP BENDING STRESSES ON TWO C4-S-B5 DRY-CARGO SHIPS OPERATING IN NORTH ATLANTIC SERVICE.
Progress rept. no. 4,
by D. J. Fritch, F. C. Bailey, and N. S. Wise. Sep 64, 38p
Contract NObs88349, Proj. SR153
SSC 164

Unclassified report

Rept. on Ship Response Statistics.

Descriptors: (*Cargo ships, Stresses), Water waves, Data processing systems, Records, Data, Measurement, Atlantic Ocean.

Records of wave-induced midship bending stresses were obtained on magnetic tape during the past three years using an unmanned instrumentation system. The reduced data cover thirty-four round trip voyages of two instrumented C4-S-B5 (machinery aft) dry-cargo vessels on the North Atlantic trade route. The data represent about 12,000 hours at sea out of five ship-years of operation. Each data point is based on a one-half hour record representing four hours of ship operation. An automatic Probability Analyzer is used in the reduction of data. All available data are presented as plots of rms stress variation and maximum peak-to-peak stress variation vs. sea state (Beaufort Wind Scale). The data were shown to be representative of a class of ships exposed to sea states corresponding to Beaufort Numbers 3-7. (Author)

AD-605 552 Div. 31, 14, 26
OTS Prices: HC $2.00/MF $0.50

Narmco Research and Development Div., Whittaker Corp., San Diego, Calif.
OPTIMUM FILAMENT DIAMETERS.
Annual summary rept. for 1 Oct 63-15 Sep 64,
by Jerome Jobaris and B. Levenetz. 15 Sep 64, 42p
Contract NObs86347, Proj. R007 03 04, Task 1008

Unclassified report

Descriptors: (*Submarine hulls, Filament wound construction), (*Composite materials, Filament wound construction), (*Filament wound construction, Composite materials), (*Glass textiles, Reinforcing materials), Filaments, Plastics, Rings, Cylindrical bodies, Hydrostatic pressure, Compressive properties, Sandwitch construction, Manufacturing methods, Mechanical properties, Design, Tests.

A program to investigate the structural behavior of large diameter (5-mil) E-glass fiber composites under complex stress systems, primarily those under bidirectional compression is described. For design use, material properties of 5-mil, E-glass fiber composites for three different resin contents were experimentally determined. Filament-wound cylinders (solid wall, ring-stiffened, and sandwich construction) representing subscale hulls of submersible structure were then designed, fabricated, and hydrostatically tested. The objective of the program was to determine if the large, unidirectional compressive strength potential of 5-mil glass fiber composites could be utilized in the design of the hull of an underwater vehicle. (Author)

AD-605 930 Div. 31, 17, 19
OTS Prices: HC $2.00/MF $0.50

Alloyd Research Corp., Watertown, Mass.
AN INVESTIGATION OF SPIN AXIS INSTRUMENT BEARINGS.
Progress rept. no. 9, 1 Nov 58-31 Jan 59,
by E. Rabinowicz, G. Reichenbach, D. Brown, and D. A. Hay. 15 Mar 59, 28p
Contract NObs72364

Unclassified report

Descriptors: (*Gyroscopes, Bearings), (*Bearings, Gyroscopes), Failure (Mechanics), Physical properties, Loading (Mechanics), Torque, Steel, Elasticity, Hardness, Temperature, Stainless steel, Carbon alloys, Chromium alloys, Vanadium alloys, Molybdenum alloys, Tungsten alloys, Silicon alloys, Manganese alloys, Tool steel.

The work is concerned with problems encountered in the performance of spin axis instrument bearings used in high angular momentum gyroscopes. These bearings fail through an increase in running friction of sufficient magnitude so that the gyroscope drive cannot maintain the

SHEAR AND ROTARY INERTIA EFFECTS ON BEAM VIBRATIONS,
by Ralph C. Leibowitz and Earle H. Kennard.
Jul 64, 18p
DTMB 1822

Unclassified report

Descriptors: (*Ship hulls, Simulation), (*Beams (Structural), Vibration), Rotation, Shear stresses, Numerical analysis.

The effects of shear rigidity and rotary inertia on a vibrating uniform free-free beam are analyzed in order to throw light on the vibration of a ship hull represented by a moderately nonuniform beam. A simple first-order approximation is devised for use in calculating several modes of vibration of a slender beam (small height-to-length-ratio) which includes these important effects. (Author)

AD-605 309 Div. 31, 30
OTS Prices: HC $4.00/MF $0.75

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
MODEL TESTS OF A SERIES OF SIX PATROL BOATS IN SMOOTH AND ROUGH WATER,
by Young Chey. Oct 63, rev. Aug 64, 112p
SIT-DL-985
Contract NObs78349, Proj. 2648 223

Unclassified report

Revision of AD-426 914.

Descriptors: (*Boats, Model tests), (*Model tests, Boats), (*Patrol craft, Model tests), Fluid dynamic properties, Performance (Engineering), Hydrodynamic configurations, Water waves, Yaw, Pitch (Motion), Center of Gravity, Acceleration, Hulls (Marine), Design.

Three round-bottom models and three hard-chine models, with lengthbeam ratios of 3, 4 and 5 in each group and with constant displacement, were tested in smooth water and in irregular waves of Sea States 3 and 5. The hard-chine model and the round-model of length-beam ratio 4 were used to evaluate relative broaching tendencies in regular following waves. The resistance data in smooth and rough water were expanded to boat weights of 55,000 pounds. The measured values of accelerations, at the forward quarter point and LCG position, and of heave, are presented. In the evaluation of relative broaching tendencies in regular following waves, experimental results were combined with theoretical results to derive indices of broaching. (Author)

AD-605 395 Div. 31, 9
OTS Prices: HC $2.00/MF $0.50

Stevens Inst. of Tech., Hoboken, N. J.
INVESTIGATION OF BENDING MOMENTS WITHIN THE MIDSHIP HALF LENGTH OF A MARINER MODEL IN EXTREME WAVES.
Progress rept. no. 1,
by Naresh M. Maniar. Jun 64, 28p
Contract NObs88263, Proj. SR 165
SSC 163

Unclassified report

Descriptors: (*Cargo ships, Structural properties), (*Ships (Nonmilitary), Structural properties), Stresses, Ship models, Deformation, Moments, Measurement, Water waves, Model basins, Hydrodynamics, Marine engineering.

One objective of this project was to obtain experimental model data to describe the lengthwise vertical wave bending moment distribution within the midship half length of a normally loaded Mariner type cargo ship in regular head and following waves having wave height/wave length ratios between 0.05 and 0.11; a second loading conditions was also examined. A second objective was to determine whether the moments tend to reach an upper limit as wave height increases. A 1/96 scale model was cut to form six segments which were jointed by an aluminum beam. The beam was strain gaged to measure bending moments at the hull cuts at stations 5, 7-1/2, 10, 12-1/2 and 15. Within practical operational limits for the Mariner type ship, maximum wave bending moments in high regular waves occur in the region from amidships to .125L aft of amidships. Hogging and sagging moment at any section were generally proportional to wave height up to a wave height/wave length ratio of 0.11, the steepest wave that could be generated. (Author)

AD-605 398 Div. 31, 9
OTS Prices: HC $5.00/MF $1.00

Massachusetts Inst. of Tech., Cambridge.
PERIODIC PROPELLER FORCES IN NON-UNIFORM FLOW,
by Neal A. Brown. Jun 64, 164p MIT-DNA-64-7
Contract Nonr1841 80, Proj. S R009 01 01

Unclassified report

Descriptors: (*Propellers (Marine), Vibration), (*Harmonic analysis, Hydrodynamics), Fluid dynamic properties, Three-dimensional flow, Vortices, Ship structural components, Marine engineering, Programming (Computers).

Ship screws experience vibration inducing periodic forces at blade frequency and its multiples because of their operation in the circumferentially non-uniform flow field of the wake. These forces are presently computed on the basis of either quasi-steady analyses or stripwise application of the Sears function for the unsteady lift of a two-dimensional airfoil subjected to sinusoidal gusts. The quasi-steady analyses are correct only at zero frequency while the unsteady strip theory is presumed correct only at high frequencies because of the neglect of three-dimensional effects in the latter. Using a vortex sheet model, the linearized integral equation for the bound vorticity of the blades is derived. This is simplified by approximations analagous to those made by Reissner for the plane wing. The difference between the downwash in the three and two-dimensional flows is determined in a vortex line model of the propeller. The analysis proceeds on the basis of computing a correction to the two-dimensional unsteady strip theory to account for three-dimensional effects.

AD-605 459 Div. 31, 9
OTS Prices: HC $5.00/MF $1.00

Technical Research Group, Melville, N. Y.
THE DYNAMIC CALCULATION OF LATERAL BENDING MOMENTS ON SHIPS IN OBLIQUE WAVES,
by A. I. Raff. Mar 64, 186p TRG-147-FR
Contract Nonr3284 00, Proj. SR009 01 01, Task 100

Unclassified report

Descriptors: (*Ships, Structural properties), (*Marine engineering, Ships), (*Hydrodynamics, Marine engineering), Ship models, Deformation, Moments, Water waves, Numerical analysis, Digital computers, Graphics.

The work is aimed at improving and extending the dynamical method for calculating lateral bending moments on ships in oblique waves developed on this project (AD-270 240) previously. The theoretical framework is first restated in a more general form. The equations of motions allow for three degrees of freedom, and all inertia, damping and cross-coupling terms. The bending moment

32. Miscellaneous Arts and Sciences

AD-605 247 Div. 32
OTS Prices: HC $4.00/MF $0.75

RAND Corp., Santa Monica, Calif.
METROPOLITAN POPULATIONS TO 1985: TRIAL PROJECTIONS,
by Ira S. Lowry. Sep 64, 104p RM-4125-RC
Unclassified report

Descriptors: (*Population, Urban areas), (*Mathematical prediction, Population), Distribution, Geography, Economics, Statistical processes, Programming (Computers).

This study summarizes the results of two series of demographic projections covering each of the 52 largest Standard Metropolitan Statistical Areas (SMSA) in the United States. These are trial projections, the first steps in a continuing effort to anticipate the probable sizes and characteristics of future metropolitan populations. For each SMSA, the 1960 population was divided into 60 components (age, by sex and color); on the basis of explicit and detailed assumptions as to rates of birth, death, and migration, the size of each component is estimated at five-year intervals, 1960-1985. The results are compared to national projections prepared by the Bureau of the Census, and to SMSA projections prepared by various local agencies. In 1960, the U.S. Census listed 52 Standard Metropolitan Statistical Areas whose populations exceeded half a million persons. These SMSA's contained a total of 80 million inhabitants, or 45 per cent of the nation's people. Assuming continued migration in the pattern of 1950-1960, the same 52 SMSA's will contain 100 million inhabitants by 1970, with a probable 124 million by 1980.

AD-605 260 Div. 32, 30
OTS Prices: HC $7.00/MF $1.50

Douglas Aircraft Co., Inc., Newport Beach, Calif.
ADAPTIVE TECHNIQUES AS APPLIED TO TEXTUAL DATA RETRIEVAL.
Final rept.
Aug 64, 306p
Contract AF30 602 3134, Proj. 4594, Task 459404
RADC TDR64 206
Unclassified report

Descriptors: (*Information retrieval, Data processing systems), (*Subject indexing, Word association), Programming (Computers), Input-output devices, Character recognition, Classification, Reliability, Monitors, Dictionaries, Vocabulary.

Document screening is considered as the formation of a classification vector whose coordinates relate the pertinence of the document to various subject fields. This vector is the resultant of vectors assigned to key words and phrases in the document. Adaptive techniques are described which assign vectors to key words on the basis of their occurrence in a corpus of preclassified documents. The results of experiments, conducted to determine the accuracy with which these adaptive techniques approximate key word relevance vectors assigned by expert judgment, are presented. An overall system design philosophy was developed which includes an automatic input mechanism and a device for monitoring the key word relevance vectors to retard system obsolescence. Methods for the hardware implementation of the system are discussed, and computer simulation results on one type of extremely efficient character recognition logic are described. A statistical model was formulated for the analysis of the document screening device. The model is used to predict system error rates as a function of the document corpora, the obsolescence of the relevance vectors, the accuracy of the input device, and the variation of other system design parameters. (Author)

AD-605 267 Div. 32, 30
OTS Prices: HC $2.00/MF $0.50

Thomas J. Watson Research Center, Yorktown Heights, N. Y.
COMPUTER PROGRAMMING TECHNIQUES FOR INTELLIGENCE ANALYST APPLICATION.
Quarterly rept. no. 1.
Aug 64, 48p
Contract AF30 602 3303, Proj. 4594
RADC TDR64 233
Unclassified report

Descriptors: (*Programming (Computers), Information retrieval), (*Information retrieval, Data processing systems), Digital computers, Programming languages, Display systems, Statistical data, Statistical analysis, Automation.

Contents: statistical prediction, discrimination, and classification technique; integrated computer-oriented information retrieval techniques; multi-programming techniques for intelligence information processing; computer console input and display (textual and graphic); automated program debugging techniques.

AD-605 358 Div. 32, 14, 17, 30
OTS Prices: HC $7.00/MF $1.75

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
AN INDEX TO MATERIALS R AND D PROGRAMS OF TEN AEROSPACE COMPANIES.
Technical memo.,
by George C. Young. Mar 64, 342p MAA-TM-62-24, suppl. 2
Proj. 7381
Unclassified report

Descriptors: (*Indexes, Materials), (*Materials, Indexes), (*Abstracts, Scientific research), Adhesives, Ceramic materials, Coatings, Fluids, Fuels, Thermal insulation, Lubricants, Metals, Alloys, Solvents, Plastics, Physical properties, Processing, Material forming, Material removal, Joining, Heat treatment.

This index (Appendix I) is a follow-on to two previous indices presented in ASRCE TM62-24 (AD-404 487) and ASRCE TM62-24 Supplement I (AD-413 858) and it covers 257 annotated abstracts describing metallics and nonmetallics R and D programs being conducted by ten aerospace companies. All of the programs described are recent and many of them are still in progress. Over 300 materials are reported. The abstracts presented were submitted by the following companies as a partial requirement of various data compilation contracts sponsored by the Materials Information Branch of the Materials Applications Division: Bell Aerospace Corp (Aerosystems Div); Boeing Company (All Divisions); General Dynamics (Astronautics); General Dynamics (Convair/Fort Worth); General Electric (Evendale); McDonnell Aircraft; North American Aviation; Northrop Corp. (Norair); Republic Aviation; Temco Vought (Vought Aeronautics). (Author)

AD-605 368 Div. 32
OTS Prices: HC $1.25/MF $0.50

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS,
Aug 64, 56p
PB 181 565
Unclassified report

rotor at synchronous speed. The main areas of activity are: (1) Careful examination of bearings which have failed in service to determine the causes of failure. (2) A determination of the pertinent physical properties of new bearing materials as functions of their metallurgical variables. (3) The testing of balls of these materials under rolling and spinning loads to study their bearing properties. (4) Running completed bearings in a torque tester to obtain friction data and to monitor friction changes occurring under operation closely simulating that found in an assembled gyroscope.

AD-605 963 Div. 31, 14
OTS Prices: HC $3.00/MF $0.75

GM Defense Research Labs., Santa Barbara, Calif.
SYNTACTIC-FOAM, FILAMENT-WOUND COMPOSITE PRESSURE HULLS.
Final rept.,
by R. M. Robertson. Sep 64, 75p GMDRL-TR64 01, rev.
Contract NObs88603, Projs. SF013 01 03, 04 21304
Unclassified report

Descriptors: (*Submarine hulls, Filament wound construction), (*Filament wound construction, Composite materials), (*Composite materials, Filament wound construction), Pressure vessels, Hydrostatic pressure, Underwater, Expanded plastics, Glass textiles, Plastic coatings, Rupture, Buoyancy, Density, Bucking (Mechanics), Epoxy plastics, Cylindrical bodies, Spheres, Tests, Glass.

External hydrostatic pressure tests were conducted on 12 fiberglass filament-wound cylinders, each 12 in. long with an ID of 5 in. Six of these had a wall thickness of 0.210 in., designed to fail by buckling at 2000 psi; the other six had a wall thickness of 0.305 in., designed to fail by buckling at 5000 psi. Three of each type were covered with an external coating of INLYTE (a buoyant syntactic foam previously developed by the contractor in an effort to stabilize the G. R. P. against buckling. The syntactic foam density was 44 lb/cu. ft. The six uncoated cylinders were used as controls. Long cylinders of fiberglass exhibit collapse characteristics under external hydrostatic pressures. The compressive stresses are not developed to their full potential. The tests were conducted to determine if a coating of syntactic foam would stabilize the units to allow more efficient use of the compressive stress. Conclusions: By coating cylinders with a layer of low-density syntactic foam, such as INLYTE, the unit is stabilized in the buckling mode, and a great increase in strength is achieved before rupture from externally-applied hydrostatic pressure. Also, the buoyancy of the composite structure is significantly increased. (Author)

AD-606 086 Div. 31, 14, 17
OTS Prices: HC $1.00/MF $0.50

Alloyd Research Corp., Watertown, Mass.
AN INVESTIGATION OF SPIN AXIS INSTRUMENT BEARINGS.
Progress rept. no. 11, 1 May-31 Jul 59,
by David A. Brown, Donald A. Hays, and Patrick G. Russell. 31 Jul 59, 18p
Contract NObs72364, Proj. NS691 031
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction will be made from the best available copy.

Descriptors: (*Lubrication, Gyroscopes), (*Gyroscopes, Bearings, Gyroscopes), Torque, Failure (Mechanics), Friction, Polymerization, Lubricants, Cleaning, Physical properties, Tool steel, Elasticity, Hardness, Temperature.

The research is concerned with problems arising in the performance of spin axis instrument bearings when used in high angular momentum gyroscope wheels. The main research efforts have been in bearing material developments, from which improved materials and treatments have resulted; however, the prevelence of failures through polymerization of the lubricant has focused the research on surface cleanliness and lubrication. In this respect, it is hypothesized that lubricant polymerization may be catylized by surface-adhered particles which remain from the final manufacturing operations. These particles cause freshly cut metal surfaces at the bearing interface which in turn emit exo-electrons which may be instrumental in the polymerization of the lubricant. Preliminary data on the polymerization of lubricants indicate that the rate of polymer formation is strongly influenced by the cleanliness of the bearing surfaces.

AD-605 482 Div. 32, 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE ROLE OF DISARMAMENT IN SOVIET POLICY: A MEANS OR AN END,
by Roman Kolkowicz. Aug 64, 16p P-2952
Unclassified report

This paper was prepared for inclusion in a symposium volume on the subject of Disarmament and Policy, to be published commercially in the spring of 1965.

Descriptors: (*Symposia, Disarmament), (*Disarmament, USSR), (*Foreign policy, USSR), Government (Foreign), Political science, Communism, Military strategy, Economics, Cold war.

In view of their militant ideology and political opportunism, do the Soviets really seek disarmament or do such policy statements have other purposes. And more specifically, what role does disarmament policy have in the whole range of Soviet policy objectives. These two questions are discussed in terms of Soviet objectives: (a) the distant goal of world communism, as determined by the ideology, and (b) the more immediate and pragmatic strategic and tactical objectives related to the conduct of current policy.

AD-605 504 Div. 32, 28
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE INTRACTABILITY OF STATES: A DISTINCTIVE PROBLEM,
by Bernard Brodie. Sep 64, 14p P-2970
Unclassified report

Descriptors: (*Foreign policy, Decision making), (*Political science, Psychology), United States government, Leadership, Social sciences, Cold war, Communism, USSR.

The influence of personal psychology on the behavior of states is discussed. An attempt is made to bring to the study of politics, including international politics, the insights of psychoanalysis.

AD-605 521 Div. 32, 12
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AN OUTER SPACE EXPERIMENT ON EARTH.
5 Aug 64, 3p
FTD TT64 743; TT 64 71327
Unclassified report

Unedited rough draft trans. from Izvestiya (USSR) 1964, no. 133, 5 Jun, p. 4.

Descriptors: (*Closed ecological systems, Soils), (*Soils, Closed ecological systems), Minerals, Plants (Botany), Growth, Spaceships, USSR.

A popularized note concerning experiments demonstrating the possible utility of vermiculite as a plant growth substrate in spaceships.

AD-605 523 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
AN ALTERNATIVE TO THE GRAND DESIGN,
by Seyom Brown. Aug 64, 18p P-2953
Unclassified report

Descriptors: (*Foreign policy, United States government), (*Defense systems, Foreign policy), Commerce, Political science, Military operations, Nuclear weapons, Europe, USSR, Communism.

The 'Grand Design,' as developed by the Kennedy Administration and carried over into the Johnson Administration, is discussed as being far from a blueprint for future political, economic, and military relationships. It is seen somewhat in the nature of an impressionist painting: the closer one examines it the more obscure it gets. Only by backing away from its specific content, and viewing it in the large, in contrast with other possible gross configurations of the North Atlantic area, can one discern the pattern and meaning. Thus, Administration spokesmen, when pressed to elaborate the design for the future implied by present U. S. policies toward Europe, are more precise in their maps of where we don't want to go than in their maps of the preferred destination.

AD-605 524 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
BOOK REVIEW: PLANNING AND STATISTICS IN SOCIALIST COUNTRIES,
by Egon Neuberger. Sep 64, 6p P-2969
Unclassified report

Report from the Indian Statistical Institute, Calcutta, on Indian Statistical Series no. 19, 1963, Pp. vi. 256. Book review prepared for publication in the Journal of the American Statistical Association.

Descriptors: (*Economics, USSR), (*Reviews, Economics), (*Communism, Economics), Population, Industries, Agriculture, Statistical data, India, Poland, East Germany, Yugoslavia.

The book being reviewed consists of 17 short papers and one long monograph, written by six leading Soviet scholars and one each from Poland, East Germany, and Yugoslavia. The papers were written while these scholars visited the Indian Statistical Institute between the years 1954 and 1959. The volume may be useful to those who do not command the requisite languages to use sources in original languages but who have a substantial familiarity with and interest in the subject of planning and statistics in socialist countries.

AD-605 540 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
STUDIES IN ECONOMIC PLANNING: A TRIP REPORT,
by Frederick T. Moore. Oct 61, 20p P-2469
Unclassified report

Descriptors: (*Foreign policy, United States government), (*Economics, Symposia), Public opinion, Government (Foreign), Foreign aid, Commerce, Europe.

A variety of people in Paris and London were interviewed about European attitudes towards foreign aid, economic integration, and domestic economic planning. An original skepticism about the potential fruitfulness of the discussions gave way to surprise at the frankness with which the individuals discussed present and future policies and problems. The attitudes and probable courses of action that were presented will in many cases pose special challenges to U. S. foreign (and domestic) economic policy.

Descriptors: (*Nebulae, X rays), (*Radar echo areas, Ionosphere), Stars, Data processing systems, Medical equipment, Chemistry, Electricity, Mechanics, Metallurgy, Ceramic materials, Nuclear physics, Atoms, Radio waves, Solid state physics, Sound, Patents, Naval research, Scientific research.

Complete papers: The lunar occultation of X-ray emmision from the crab nebula; and Radar auroral echoes. Summaries are given of research in the following fields: applications research (modifications on the Alpha Rhythm Feedback Control Unit), chemistry, electricity, mechanics, metallurgy and ceramics, nuclear and atomic physics, radio, solid-state physics, and sound.

AD-605 438 Div. 32, 23
OTS Prices: HC $4.00/MF $0.75

Ohio State Univ., Columbus.
THE UTILIZATION OF MILITARY RETIREES IN TEACHING, ADMINISTRATIVE AND SERVICE POSITIONS IN EDUCATION, 1965-1975.
Master's thesis,
by Edwin Miller Binder. 1964, 114p

Unclassified report

Descriptors: (*Education, Military personnel), (*Military personnel, Education), Social sciences, United States government, Instructors, Wages, Economics, Wages, Economics, Population, Universities, Professional personnel, Officer personnel.

The following conclusions are drawn from the research: (1) Under present circumstances, the supply of military retirees will satisfy only a minor portion of the instructor demand at all educational levels. A projected 3,700 instructors per year from the military retiree resource for the 1965-75 decade constitutes only 2.2 per cent of the annual projected demand. (2) Concentrations of retirees in the states of California, Florida, Texas and Virginia may constitute a sufficient resource to fill a higher percentage of projected demand in these states. (3) Retiring military personnel possessing the necessary qualifications should have little difficulty in securing employment in educational institutions at the level that their qualifications permit. (4) Military retirees possess many qualifications which could be utilized in educational administrative and service jobs. (Author)

AD-605 439 Div. 32, 15
OTS Prices: HC $3.00/MF $0.50

Pittsburgh Univ., Pa.
A MULTIPLE REGRESSION TECHNIQUE FOR POPULATION ESTIMATION.
Master's thesis,
by Edward F. Williams. 1964, 57p

Unclassified report

Descriptors: (*Population, Counting methods), (*Mathematical models, Population), (*Statistical processes, Population), Mathematical prediction, Data, Collecting methods, Model tests, Statistical analysis, Correlation techniques.

The multiple regression population estimation model developed by this paper was designed to meet the criteria of simplicity, accuracy, sensitivity and data availability. The model, as a result of insufficient time and funds for extensive data collections, has not been rigorously tested. Throughout the testing and verification it has received, it has successfully met the above criteria. However, the validity of the model must yet be verified over time and in different cities before any true measure of its worth as a general population estimation model for urban areas will be known. Based upon the testing of the model conducted by the author, the prognoses of its value as an urban area population estimation tool is very good. The model estimates the population of an area at any point in time for which the required input data is available. This is accomplished with a function derived by use of multiple regression. The independent variables used in the function are: elementary school enrollment, number of available housing units and the number of utility meters in service. The coefficients of the model, derived with data from Pittsburgh, Pennsylvania, as of April 1, 1960 are presented. The model, using these coefficients, is tested using data from Pittsburgh, Pennsylvania; Seattle, Washington and Los Angeles, California.

AD-605 443 Div. 32
OTS Prices: HC $2.00/MF $0.50

Office of Aerospace Research, Washington, D. C.
AUTHOR'S GUIDE FOR TECHNICAL REPORTING,
by Alexander G. Hoshovsky. Jul 64, 33p
OAR 64 8

Unclassified report

Descriptors: (*Department of Defense, Reports), (*Reports, Instruction manuals), (*Abstracting, Specifications), Handbooks, Indexes, Information retrieval, Documentation, Scientific research, Language, Air force research.

This guide has been written to present in a single pamphlet some simple rules and suggestions for the authors of OAR sponsored scientific reports. Its contents are consistent with the majority of guides used by professional journals and with the current rules and directives of the Department of Defense and the United States Air Force. Emphasis is on titles, abstracts, and key wording because these are the elements which are most important for indexing and retrieval. They are also key elements in a new Department of Defense form (DD Form 1473) which is now required as the last page in all technical documents. Also included is a portion on introductions and on writing style, which may help to alleviate the much discussed problem of ambiguity and dullness of scientific writing.

AD-605 456 Div. 32, 30
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
PALL: RAND'S AUTOMATED ADDRESS BOOK,
by G. E. Bryan. Sep 64, 89p RM-4258

Unclassified report

Descriptors: (*Printing, Special purpose computers), (*Reports, Distribution), Documentation, Input-output devices, Programming (Computers), Tapes, Data storage systems, Computer operators.

The PALL program ('Prints Address Lists and Labels') has been in use since early 1963 to produce the various pieces of paper--distribution lists, receipts, mailing labels, and order forms--required in the distribution of RAND publications. It maintains a master file of some 850 organizations approved to receive various categories of RAND reports. In design and operation, the program resembles a two-pass assembler and makes extensive use of modern string-handling, pointer, and dictionary techniques. Section I of the Memorandum is a brief discussion of the origin, operation, and advantages of PALL. Section II contains the instructions for users of the program; Section III, the instructions for operators. Section IV describes the program's operation, step by step, and Section V discusses its formats. (Author)

AD-605 742 Div. 32, 12
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE ARTIFICIAL SATELLITE AND INTERNATIONAL LAW,
by G. Zadorozhnyi. 12 Nov 57, 10p T-78
TT 64 71361

Unclassified report

Trans. from Sovetskaya Rossiya (USSR) 1957, 17 Oct.

Descriptors: (*Satellites (Artificial), Law), (*Law, Upper atmosphere), Earth, Orbital trajectories, USSR, Theory, Social sciences.

This paper discusses the status of orbiting artificial satellites in relation to air sovereignty of states and international law.

AD-605 744 Div. 32, 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOVIET COMMENTARY ON THE DOCTRINE OF LIMITED NUCLEAR WARS: SMOKE SCREEN OF THE AMERICAN IMPERIALISTS,
by V. Mochalov and V. Dashichev. 5 Mar 58, 12p
T-82
TT 64 71363

Unclassified report

Trans. from Krasnaya Zvezda (USSR) 1957, 17 Dec.

Descriptors: (*Limited war, Nuclear weapons), (*Foreign policy, Nuclear warfare), United States government, Military strategy, Political science, Cold war, Newspapers, Public opinion, Propaganda, USSR.

The American foreign policy regarding limited warfare and the use of nuclear weapons is presented. The American policy is described by the Soviet press as imperialistic, aggressive, and politically dangerous.

AD-605 747 Div. 32, 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE QUESTION OF THE PRE-EMPTIVE BLOW,
by V. Kurasov. 12 May 58, 18p T-87
TT 64 71366

Unclassified report

Trans. from Krasnaya Zvezda (USSR) 1958, 27 Apr.

Descriptors: (*Foreign policy, USSR), (*Cold war, Military strategy), United States government, Newspapers, Nuclear warfare, Communism, Government (Foreign), Limited war, Propaganda, Political science.

The Soviet view regarding the unleashing of future wars is presented. The idea that America is planning a surprise attack against the USSR is suggested and criticized as being an aggressive, imperialistic design.

AD-605 773 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
A PROPOSAL FOR THE INDIRECT RETRIEVAL OF UNPUBLISHED TECHNICAL MATERIAL,
by R. L. Patrick. Aug 62, 6p P-2616 Unclassified report

Descriptors: (*Information retrieval, Scientific research), (*Department of Defense, Information retrieval), Bibliographies, United States government, Subject indexing, Reports, Magnetic tape, Documentation.

The Armed Service Technical Information Agency provides an information retrieval service to Department of Defense contractors with a demonstrated need to know. This Paper proposes a subsequent search of the Field of Interest Register if a regular ASTIA bibliographic search fails to produce a stipulated minimum number of items. (Author)

AD-605 774 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
A CREDO OF PUBLIC POLICY TOWARD THE DEPENDENCY PROBLEM IN CALIFORNIA,
by Vaughn D. Bornet. Oct 62, 10p P-2645

Unclassified report

Descriptors: (*California, Sociology), (*Sociology, California), Public relations, Social sciences, Public opinion, Costs, Population.

In California there are many dependents who receive a sizable amount of money as a group. A considerable administrative machinery is required to handle the various programs of aid and service. These problems are discussed and analyzed in the report.

AD-605 790 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE MEASUREMENT OF VALUE,
by N. C. Dalkey. 4 Nov 49, 4p P-110A

Unclassified report

Descriptors: (*Economics, Theory), (*Game theory, Economics), Probability, Mathematical prediction, Standards, Acceptability, Measurement, Psychometrics, Costs.

The fundamental contemporary issue in the theory of value is the objectivity of values. Since the notion of value is basically quantitative this issue comes down to the question: are values measurable. Von Neumann and Morgenstern in their book Theory of Games and Economic Behavior have suggested an ingenious yardstick, namely the comparison of goods with probability combinations. They have demonstrated that such comparisons allow the construction of a numerical scale for values which is unique except for the choice of zero point and an arbitrary scale factor. This theory is discussed from a critical point of view.

AD-605 794 Div. 32, 12
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE QUESTION OF INTERPLANETARY LAW AND FOR EQUAL COLLABORATION IN THE PEACEFUL USE OF COSMIC SPACE,
by A. Galina. 25 Sep 58, 24p T-98
TT 64 71374

Unclassified report

Trans. of Sovetskoe Gosudarstvo i Pravo (USSR) 1958. no. 7, p. 52-58 and Izvestiya (USSR) 1958, 17 Sep, p. 5.

Descriptors: (*Space flight, Law), (*Law, Space flight), (*Foreign policy, United States), Government (Foreign), Stratosphere, Exosphere, Military strategy, Disarmament, Satellites (Artificial), Space stations, USSR, Spacecraft.

AD-605 631 Div. 32, 18
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
POLITICAL NEGOTIATION AS A PROCESS OF MODIFYING UTILITIES,
by Fred Charles Ikle and Nathan Leites. Nov 61, 28p P-2482
Unclassified report

Paper prepared for publication in the Journal of Conflict Resolution, March 1962.

Descriptors: (*Bargaining, Game theory), (*Game theory, Political science), (*Political science, Bargaining), Foreign policy, Theory, Decision making, Government (Foreign).

Negotiating techniques are discussed in terms of the theory of bargaining and game theory.

AD-605 683 Div. 32
OTS Prices: HC $5.00/MF $1.00

University of Southern California, Los Angeles.
STUDIES IN THE PHONOLOGY OF ASIAN LANGUAGES. II. DURATION OF KOREAN VOWELS.
Final rept.,
by Mieko S. Han. 25 Jul 64, 192p
Contracts Nonr233 80, Nonr228 28, Proj. NR049 183
Unclassified report

See also AD-430 715.

Descriptors: (*Language, Asia), (*Speech representation, Analysis), Speech, Sound, Time.

The aim of the study is to describe a part of the phonological rules of Korean. Limiting itself to one of the features, i.e. the duration of vowels, an attempt is made to establish phonetic habits that control actual vowel length in Korean. If the feature of vowel duration is a distinctive feature in the language each actual occurrence of a vowel must be interpreted as being either short or long. Then, our knowledge of how each vowel changes its length according to its environment is important in order to determine whether or not a given vowel should be analysed as short or long in a given environment. The sample analysis presented dealing with complex acoustical data may be regarded as a possible analytical procedure in descriptive linguistics.

AD-605 693 Div. 32
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
SOVIET NATIONAL INCOME,
by Abram Bergson. 29 Nov 60, rev. Oct. 61, 82p P-2148-1
Unclassified report

Paper was due to be published in a volume of Proceedings of the Princeton Conference on Economics of Soviet Industrialization, Princeton, N. J., May 1961.

Descriptors: (*Symposia, Economics), (*Economics, USSR), Industrial production, Agriculture, Labor, Communism, Government (Foreign), Money, Social sciences, United States government, Commerce.

The rate of growth of total output and the rate of growth of factor productivity in the USSR are discussed. The productivity of different factors taken together and corresponding trends in the United States are also examined.

AD-605 694 Div. 32
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
BY AUTOMOBILE THROUGH WESTERN RUSSIA,
by Edward C. De Land. Oct 61, 69p P-2461
Unclassified report

Descriptors: (*Culture, USSR), (*USSR, Culture), Social sciences, Population, Transportation, Urban areas, Rural areas, Recreation, Government (Foreign), Museums, Czechoslovakia, Poland.

A tourist's trip through western Russia, Poland, and Czechoslovakia is described. Personal observations of the culture, the people, transportation and recreational facilities, the major cities, and rural areas are given.

AD-605 699 Div. 32, 7, 14, 27
OTS Prices: HC $3.00/MF $0.75

Aerospace Corp., Los Angeles, Calif.
APPLIED RESEARCH PROGRAMS ABSTRACT BULLETIN. FLIGHT VEHICLE POWER AND MATERIALS, VOLUME II, (PART I). ABSTRACTS 2-1 THROUGH 2-81,
by K. B. Andrews, N. B. Crow, M. S. Hicks, E. Moore, and E. H. Smith. Jul 62, 72p TDR-930(2701-01)TN-1, v. 2, pt. 1, no. 1
Contracts AF04 647 930, AF04 695 169
DCAS TN61 3 V2 P1 N1
Unclassified report

Descriptors: (*Power supplies, Reviews), (*Propulsion, Reviews), (*Materials, Reviews), Space propulsion, Energy conversion, Batteries and components, Magnetohydrodynamics, Nuclear properties, Solar energy, Solar cells, Thermionic converters, Thermoelectricity, Metallurgy, Refractory materials, Plastics, Composite materials, Electrical equipment, Electronic equipment, Magnetic materials, Hydraulic fluids, Lubricants, Manufacturing methods, Abstracting, Bibliographies.

The Bulletin contains abstracts of the unclassified literature on the subject of Flight Vehicle Power. Abstracts of selected references in the field of materials are also included. All abstracts are prepared from the original reports and are limited to those available within Aerospace Corporation. (Author)

AD-605 709 Div. 32
OTS Prices: HC $1.25/MF $0.50

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS.
Apr 64, 44p
PB 181 561
Unclassified report

Also available on subscription $10.00/year.

Descriptors: (*Tunnel diodes, Feasibility studies), (*Ionosphere, Ions), Atmosphere, Astrophysics, Chemistry, Metallurgy, Ceramic materials, Nuclear physics, Atoms, Radio communication systems, Solid state physics, Radar, Transducers, Single crystals, Patents.

Complete papers: High-current tunnel diodes; and Recent NRL contributions to ionospheric physics. Summaries are given of research in the following fields: atmosphere and astrophysics, chemistry, metallurgy and ceramics, nuclear and atomic physics, radio, solid-state physics, and sound.

by Douglas H. Scott. Jul 62, 8p P-2589

Unclassified report

Paper prepared for Annual Convention of the Society of Technical Wirters and Publishers (no. 9) Philadelphia, 7 Jun 62.

Descriptors: (*Language, Symposia), (*Symposia, Language), Social communication, Professional personnel, Reports, Vocabulary.

Technical writers who are hypnotized by the mechanical metaphor inevitably produce robot writing - a separate language, distantly related to the prose of Darwin, Huxley, Jeans, and Einstein. Where they were clear, fresh, and graceful, the robot writer is hard, dull, and clumsy. Where they were merely human, the robot writer is infallible, prefabricated, impersonal, and irresponsible. These four characteristics are interlinked. An example of one usually illustrates the other three.

AD-606 077 Div. 32, 16
OTS Prices: HC $1.00/MF $0.50

Technische Hochschule, Munich (West Germany).
EXPERIMENTS ON THE EFFECTS OF COMBINED WAVELENGTHS ON PHOTOSYNTHESIS.
Technical (final) rept.,
by O. Kandler. 1 May 64, 19p
Grant AF EOAR63 10
AFOSR 64 1650

Unclassified report

Descriptors: (*Algae, Photosynthesis)(*Photosynthesis, Algae), Optical equipment, Laboratory equipment, Design, Light, Colors, Mixtures, Optimization, Air, Carbon dioxide, West Germany.

The apparatuses were constructed, of which each allows the projection of two monochromatic beams of a high light intensity on the same area of an algae suspension. One device is based on monochromators which are equipped with gratings, the other consists of projectors with interference filters. A suitable cuvette was constructed to expose an algae suspension to the beams, while they are supplied with an air-CO2 mixture at a constant rate of flow and kept at constant temperature. Photosynthesis is measured by the increase of radioactivity, which is taken up from C14O2. Experiments to elucidate the optimal conditions for photosynthesis under our special arrangments are described. Preliminary experiments with combined wavelengths showed the following results: If blue light is added to red light, there is a decrease in photosynthesis of about 20% below the value obtained by the addition of photosynthesis with the single light beams. If far red light is added to red light a remarkable increase of 20 to 80% is observed. (Author)

33. Transportation

AD-605 857 Div. 33, 32
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
A REPORT ON AN URBAN TRANSPORTATION MODEL, SOME PROGRESS AND SOME PROBLEMS,
by John F. Kain. Jun 62, 30p P-2549

Unclassified report

Paper prepared for presentation at the Annual Meeting of the Western Section of the Regional Science Association (1st), Berkeley, Calif., 29 Jun 62.

Descriptors: (*Transportation, Urban areas), (*Urban areas, Transportation), Simulations, Engineering, Social sciences, Urban planning, Costs, Design, Construction, Population, Industries, Government employees, United States government, Symposia.

An exploratory study of urban transportation is described. The skills of engineers and social scientists were combined to carry out a systems analysis embracing both the engineering and economic questions of urban transportation. The study was not tied to solving the urban transportation problems of any specific municipality or urban area; it was decided that RAND should attempt to utilize and integrate the findings and data obtained by the large and expensive urban-planning and transportation studies conducted during recent years in major urban areas. In particular, it was felt that the large amounts of data obtained for these studies had not been fully exploited. A substantial program of empirical research, drawing on this large pool of empirical information, was also decided upon.

AD-605 815 Div. 32, 17
OTS Prices: HC $4.00/MF $0.75

Belfour Engineering Co., Suttons Bay, Mich.
THE MECHANICAL PROPERTIES DATA CENTER OPERATION AND EXPANSION.
Summary technical rept. for 1 Apr 63-31 Mar 64,
by R. C. Braden and C. S. Wright. 3 Aug 64, 105p
Contracts AF33 615 1061, AF33 657 9149, Proj. 7381, Task 738103
ML TDR64 235

Unclassified report

Descriptors: (*Subject indexing, Mechanical properties), (*Information retrieval, Libraries), Data processing systems, Data storage systems, Display systems, Data Metals, Alloys, Documentation.

The report discusses the content, use and operation of the Mechanical Properties Data Center. Search frequency, data input, document acquisition, and link-role indexing are topics of the report. A review of project activities expressed as percentages of expended effort is presented. (Author)

AD-605 822 Div. 32, 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
A PARSING PROGRAM FOR CATEGORIAL GRAMMARS,
by Martin Kay. Sep 64, 30p RM-4283-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Programming (Computers), Language), (*Language, Programming (Computers)), Analysis, Vocabulary, Programming languages, Computer logic, Data storage systems.

The paper describes a computer program for parsing sentences using a categorial phrase-structure grammar. The distinguishing feature of a categorial grammar is that the tags associated with individual words contain all the information necessary to recognize sentences and determine their structures. The familiar table of grammatical rules has no analog within this system. Clearly, the grammatical tags of a categorial grammar cannot be merely arbitrary names for classes of words and phrases but must have a definite structure of their own. The greater part of the paper is given to a discussion of this structure and an algorithm that exploits it. Various ways of representing tags on paper and in the computer are considered, together with corresponding variants of the algorithm.

AD-605 823 Div. 32, 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE LOGIC OF COGNATE RECOGNITION IN HISTORICAL LINGUISTICS,
by Martin Kay. Sep 64, 24p RM-4224-PR
Contact AF49 638 700

Unclassified report

Descriptors: (*Language, Analysis), (*Mathematical logic, Language), Programming (Computers), Vocabulary, History.

The paper presents a formalization in terms of elementary propositional logic of one of the most crucial steps in the comparative method, namely, that in which modern derivatives of prehistoric phonemes are recognized. The basic assumption on which the theory rests is that the words of a hypothetical prehistoric language should be constructed in such a way as to minimize the total number of phonemes in the language and of the statements that need to be made to account for the forms of the modern words. The theory is sufficiently specific to provide an algorithm for a computer program. However, the amount of computation rises sharply with any increase in the amount of data to be considered, and with present techniques it is prohibitive even for trivially small data sets. Nevertheless, the theory provides a basis on which more efficient heuristic procedures might be built. (Author)

AD-605 920 Div. 32
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ECONOMIC UNION IN EAST AFRICA: AN EVALUATION OF THE GAINS,
by Benton F. Massell. Sep 64, 36p P-2971

Unclassified report

Descriptors: (*Economics, Africa), (*Africa, Economics), Industries, Industrial production, Commerce, Population, Consumption, Commerce, Transportation, Costs, Government (Foreign), Kenya, Tanganyika.

Identifiers: Uganda, East African Common market.

The discussion is limited to the effect of the East African Common Market on investment in manufacturing. This is not because of an assumed unimportance of the agricultural and mining sectors, nor because economic development is identified with industrial development. Rather this focus reflects a belief that economic integration among a group of less-developed countries has its principal effect on industrial development. This is probably especially true in the East African case. Because agriculture and mining are geared largely to export markets, they receive little direct stimulus from an expansion of the local market. It is doubtless true that economic integration has a secondary effect on non-industrial sectors, arising from the increase in industrial output that in turn is stimulated by economic integration. However, this report is concerned only with the primary effects.

AD-605 921 Div. 32
OTS Prices: HC $3.00/MF $0.50

RAND Corp., Santa Monica, Calif.
FRANCE AS A NUCLEAR POWER,
by C. E. Zoppo. Apr 62, 52p P-2485

Unclassified report

Descriptors: (*Foreign Policy, France), (*France, Nuclear weapons), Government (Foreign), Political science, Deterrence, Power, Military strategy, Defense systems, Nuclear bombs, Cold war, Armament, Western Europe, United States.

The military worth of independent national nuclear strike forces has been strongly questioned, but the French government seems bent upon developing such a force nevertheless. Moreover, a number of continental military analysts have attempted to endow this policy with a theoretical basis. The thesis advanced in this report hinges on the assumption that a nation of less than great power status can acquire a nuclear deterrent of its own effective enough to impress a superpower.

AD-606 017 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
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NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are included in the subject index.

2. Astronomy, Geophysics and Geography

AD-286 801 Div. 2, 20
OTS Prices: HC $1.00/MF $0.50

Massachusetts Inst. of Tech., Cambridge.
APPLICATION OF WEATHER RADAR TO FALLOUT PREDICTION.
Quarterly technical rept. no. 17, 1 Mar-31 May 62, by Pauline M. Austin. 15 Jun 62, 21p
Contract DA36 039sc75030, Proj. 3A99 07 001 01 03
Unclassified report

See also AD-282 023

Descriptors: (*Nuclear explosions, Radioactive fallout), (*Radioactive fallout, Meteorological radar), (*Meteorological radar, Radioactive fallout), Precipitation, Storms, Meteorological instruments, Data processing systems.

Because of an unusually dry spring, data were taken infrequently during the past quarter. Only six good storms were recorded; these included two cases of thunderstorms with hail. Progress in instrumentation has been excellent. Devices for quantization of the output from the delay-line integrator and for the simultaneous display of several intensity levels have been completed and tested. They are ready to be incorporated into the system for routine observations. An AN/CPS-9 radar has been received and stored. Meanwhile the RHI display will be used with the SCR-615-B radar. Work is continuing on reduction of intensity contour data to digital form and on analysis of the vertical structure of storms. Computations concerning the dispersion of the radioactive cloud from a 10KT detonation in various wind fields are nearly complete. We expect to resume consideration of a megaton detonation during the coming quarter. (Author)

AD-442 437 Div. 2, 6, 14
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
TEST RESULTS OBTAINED WITH A 60-CM PARABOLIC MIRROR [AND] THE PROBLEM OF SELECTING MIRROR MATERIAL AND THE POSSIBILITY OF USING CERAMICS FOR MIRRORS,
by Shih-ching Yang and Te-p'ei Li. 3 Jun 64, 24p
FTD TT64 170, TT 64 71199
Unclassified report

Edited trans. of T'ien Wen Hsueh Pao (Chinese People's Republic) 1962, v. 10, no. 1, p. 24-33.

Descriptors: (*Ceramic materials, Mirrors), (*Telescopes, Mirrors), (*Mirrors, Parabolic bodies), Astronomy, Optical equipment, Reflectors, Optical glass, Surfaces, Coatings, Test methods, Thermal conductivity, China.

The test methods used in repolishing the 600-millimeter parabolic mirror for the telescope built at Nanking in 1958 are described. The compensation shadow method was used as a working method, while quantitative examinations were made by a visual method using an ocular and the Hartmann photographic procedure. A photograph of the compensation-set up shadow pattern is presented. The results of quantitative tests are also given. The paper sets forth requirements to be met by mirror materials, the Matsutov coefficient, and w for evaluation of materials as regards temperature strains and relative mirror weight. The properties of porcelain, and the possibility of using porcelain mirrors are examined. The preliminary results of experimentation with such a mirror are set forth. (Author)

PB-166 101 Div. 2, 30
OTS Prices: HC $1.00/MF $0.50

Coast Guard, Washington, D. C.
COAST GUARD OCEANOGRAPHY.
Progress rept.
15 Aug 63, 12p
Unclassified report

Descriptors: (*Oceanology, Coast Guard Research), (*Coast Guard Research, Oceanology), Marine meteorology, Radioactivity, Ice, Ocean waves, Lakes, Oceans, Oceanographic vessels.

These pages are intended to summarize the accomplishment and progress of the Coast Guard in oceanographic research since that function was added to the Coast Guard statutory mission by congressional act on 5 October 1961. The ensuing two years have been a planning and drafting stage which is rapidly drawing to a close. The purpose of this report is to review this stage in preparation for the years ahead. (Author)

PB-166 102 Div. 2, 25
OTS Prices: HC $1.00/MF $0.75

Owens Valley Radio Observatory, Calif. Inst. of Tech., Pasadena.
MEASUREMENTS OF THE FLUX DENSITY OF DISCRETE RADIO SOURCES AT DECIMETER WAVELENGTHS,
by Kenneth I. Kellermann. 1963, 25p
Contract Nonr220 19
Unclassified report

Observations of the Owens Valley Radio Observatory, 1963-11

Descriptors: (*Electromagnetic fields, Extraterrestrial radio waves), (*Extraterrestrial radio waves, Electromagnetic fields), Ultrahigh frequency, Interferometers, Astronomical observatories, Antenna feeds, Errors, Noise (Radio), Resolution, Gain, Stars, Astronomical data, Measurement.

A series of measurements of the relative flux density of discrete radio sources were made at 475, 710, 958, 1420, and 2841 Mc/s, using a two-element interferometer. The flux density scale at each frequency was fixed by referring these relative intensities to a series of calibration sources whose spectra were reasonably well determined. A complete list of the measured flux densities is given with a description of the experimental technique and a discussion of the sources of error. At

AD No.	Div.	AD No.	Div.	AD No.	Div.	AD No.	Div.
606 131	25	606 136	28	606 140	25	606 144	2
606 132	20	606 137	8	606 141	2	606 145	8
606 133	9	606 138	17	606 142	13	606 146	4
606 135	14	606 139	17	606 143	25	606 147	14

7. Electrical Equipment

AD-275 646 Div. 7, 4
OTS Prices: HC $4.00/MF $0.75

Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATIONS OF NEW SOLAR REGENERATIVE FUEL CELL SYSTEMS.
Final progress rept. for 15 Mar 61-14 Mar 62,
by John J. Rowlette. 24 Mar 62, 120p EOS-1720
Contract DA36 039SC87425, ARPA Order 80 61
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction will be made from the best available copy.

Descriptors: (*Solar cells, Fuel cells), (*Fuel cells, Solar cells), (*Energy conversion, Solar radiation), Photochemistry, Thermochemistry, Thermodynamics, Thermionic converters, Decomposition, Hydrogenation, Halogen compounds, Oxides, Chlorates, Iodates, Sulfates, Nitrates, Silicates, Cyanides, Borates, Organic compounds, Inorganic compounds, Iodine, Dissociation.

Solar energy conversion is examined from the standpoint of fuel cells regenerated either photochemically or thermally. The conclusion is reached that very few photochemical reactions known at present are suitable for solar energy conversion. An exception appears to be reactions based on the photo-dissociation of iodine. A set of criteria is suggested for evaluating chemical systems for use in thermally regenerative fuel cells, and some of these criteria are then applied to several classes of compounds. The theoretical maximum efficiencies are determined by the temperature limits and heat capacities. By this criterion alone it would appear that a large number of chemical systems would be suitable for thermal energy conversion, but the application of the other criteria eliminate most of these from consideration. A kinetics analysis indicates that for most systems dissociator reaction rates should offer no difficulties, but in the absence of more experimental data no conclusions are drawn concerning electrochemical rates. (Author)

8. Electronics and Electronic Equipment

PB-166 139 Div. 8
OTS Prices: HC $3.00/MF $0.75

Louisiana State Univ., Baton Rouge.
A QUALITATIVE ANALYSIS OF NEGATIVE RESISTANCE.
Div. of Engineering Research bulletin,
by Alan Howard Marshak. 1964, 84p LSU-ERB-73
Unclassified report

Also available from Louisiana State Univ., $2.50.

Descriptors: (*Negative resistance circuits, Analysis), Oscillators, Relaxation oscillators, Amplifiers, Noise (Radio), Transistors, Generators, Models (Simulations), Mathematical analysis, Equations.

Negative resistance may be defined by a driving-point characteristic which satisfies the relationship, dv/di<0. This condition implies an increasing current for a decreasing voltage over some range of operation. This paper is a general study of the fundamental concepts of negative resistance and of the elements and devices which exhibit this property. It is shown that negative resistance may be used to explain the mathematical requirements for sustained oscillation, as well as the correlation between passive and active networks. For oscillation to occur, negative resistance is necessary to nullify the positive resistance encountered within every resonant network. In this respect, the negative resistance may be thought of as contributing the necessary energy for oscillation. This study also presents a new current-controlled negative resistance device whose salient characteristic is the generation of a relatively linear region of negative resistance which is symmetrical about the voltage abscissas and hence requires no d-c biasing to stabilize a quiescent condition. The device therefore exhibits a bilateral characteristic with respect to a-c signals. Design criteria for negative resistance bilateral amplifiers and two-terminal oscillators are given as are the equations relating gain, noise, and stability. (Author)

12. Guided Missiles

AD-270 474 Div. 12
OTS Prices: HC $7.00/MF $1.75

Kidde (Walter) and Co., Inc., Belleville, N. J.
STUDY OF INTEGRATED CRYOGENIC FUELED POWER GENERATING AND EVIRONMENTAL CONTROL SYSTEMS. VOLUME II: CRYOGENIC TANKAGE INVESTIGATION,
by C. W. Spieth. Nov 61, 388p
Contract AF33 616 7508, Proj. 3145, Task 30328
ASD TR61 327 V2
Unclassified report

Prepared on subcontract by Beech Aircraft Corp., Boulder, Colo. Legibility of this document is in part unsatisfactory. Reproduction will be made from best available copy, See also AD-270 471.

Descriptors: (*Manned spacecraft, Auxiliary power systems), (*Auxiliary power systems, Manned spacecraft), (*Tanks (Containers), Cryogenics), Storage, Propellant control, Weight, Pressure, Hydrogen, Oxygen, Liquified gases, Thermal insulation, Performance (Engineering), Heat exchangers, Design, Control systems.

This document reports technical data pertaining to storing and expelling cryogenic fluids for auxiliary power systems suitable for use in manned space vehicles. Parametric weight and size studies were made with consideration of the propellant fluids in overcritical and subcritical pressure conditions. H2 and O2 tank systems designs are presented for overcritical and subcritical pressure conditions for a specific 6.5- hour orbit mission. Advantages, disadvantages, reliability, and detailed weight calculations are reported for each respective system. Testing to determine response times, heat required to expel H2 propellant, flow rate, and tank pressure control resulted in satisfactory performance that closely agreed with predicted theoretical calculations. Quick disconnects were also tested at LH2 temperatures, with satisfactory results. Finally, breadboard specifications are prepared for the tank system to be designed and fabricated in the Phase II continuation of the project. (Author)

AD-270 491 Div. 12
OTS Prices: HC $7.00/MF $1.50

Kidde (Walter) and Co., Inc., Belleville, N. J.

each frequency the uncertainties in the relative flux densities are typically between five and ten per cent. Because of the similar observing and reduction technique employed at each frequency, the results form an especially self-consistent set of data, which is well suited for studies of radio spectra. (Author)

PB-166 248 Div. 2, 12, 23, 32
OTS Prices: HC $3.00/MF $0.75

LEADING SCIENTISTS OF THE USSR IN THE FIELDS OF ASTRONOMY, GEOPHYSICS, AND SPACE PHYSICS.
Nov 64, 94p PAL-64-9

Unclassified report

Descriptors: (*Scientific personnel, USSR), (*Astronomy, Scientific personnel), (*Geophysics, Scientific personnel), (*Astronautics, Scientific personnel), Bibliographies.

These lists of Soviet scientists and brief items of information on their affiliations, professional fields, and research interests have been compiled from scientific journals and other related publications during the period 1960-1964. The information may be useful to scientists and others who have occasion to attend international scientific conferences or serve on committees of international organizations in the fields of astronomy or the geophysical or space sciences.

4. Chemistry

PB-166 241 Div. 4, 17
OTS Prices: HC $3.00/MF $0.75

AiResearch Mfg. Co., Phoenix, Ariz.
HEAT TRANSFER AND CORROSION CHARACTERISTICS OF CAPILLARY FLUTED ALUMINUM TUBES.
Final engineering rept.
by E. L. Kumm. Oct 64, 96p GT-7254-R4
Contract 14 01 0001 362
OSW PR103

Unclassified report

Descriptors: (*Aluminum, Corrosion inhibition), (*Heat transfer, Aluminum), Sea water, Desalination, Water supplies, Distilling plants, Evaporators, Heat exchangers, Condensers (Liquefiers), Coatings, Capillary tubes, Costs.

The studies reported here are aimed primarily at the vapor-compression distillation saline-water conversion system using thin-film evaporation which can approach the theoretical ideal of minimum work in obtaining pure water. Smaller temperature differentials and less compression work is required if the thin-film evaporation at almost constant pressure is used rather than forced convection to a liquid which is then allowed to evaporate in a region of lower pressure. The basic problem with thin-film evaporation is concerned primarily with the formation and maintenance of the thin film without deterioration over the heat-transfer surface. Ebullition or boiling in a liquid film inside a tube can cause salt deposits and corrosion, as well as reduce heat transfer to the fluid. Nevertheless, some equipment, such as the LTV evaporator, apparently operates with boiling in the falling film or liquid. (Author)

PB-166 253 Div. 4, 13
OTS Prices: HC $4.00/MF $0.75

Koppers Co., Inc., Pittsburgh, Pa.
DEVELOPMENT OF AN ANALYTICAL METHOD FOR MEASURING THE HYDROCARBON CONTENT IN WATER.
Research and development progress rept.
by Marjorie A. Phillips, William R. Holden, Edgar W. Albaugh, William E. McKinstry, and Harold A. Sweeney. Nov 64, 104p
Contracts OSW14 01 001 204; OSW14 01 0001 344
OSW PR115

Unclassified report

Descriptors: (*Sea water, Desalination), (*Hydrocarbons, Chemical analysis), (*Desalination, Coolants), Water supplies, Impurities, Gases, Butane, Alkenes, Test equipment, Design, Hydrogen, Ionization.

An analytical method was developed for monitoring the propane content of the potable water and effluent streams from the Koppers' Hydrate Process for the desalination of sea water. This method is capable of determining propane in water over the range of 0.05 to 2.0 ppm. by weight. It is applicable also to the determination of Freon-12, under consideration for use in Koppers' Hydrate Process, and to the determination of n-butane, isobutane, and butene-1, compounds under consideration as working fluids for freezing processes for desalination. Utilization of a gas stripping unit in conjunction with a hydrogen flame ionization detector frees this method from interference from salts, from other organic matter normally present in the sea water, and from the water itself. A prototype unit was designed and tested under pilot plant conditions. (Author)

6. Detection

PB-166 239 Div. 6, 7, 19, 22
OTS Prices: HC $7.00/MF $1.50

Office of Scientific Research and Development. Div. 6.
UNDERWATER SOUND EQUIPMENT V. INSTRUMENTS, ATTACK AIDS AND MISCELLANEOUS ORDNANCE.
Summary technical rept., vol. 18.
1946, declassified 2 Aug 60, 315p STR-6-18
AD 221 594

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Sonar equipment, Antisubmarine fire control systems), (*Antisubmarine fire control systems, Fire control system components), (*Ordnance, Antisubmarine warfare), Monitors, Echo ranging, Simulators, Underwater ordnance, Antisubmarine weapon projectors, Antisubmarine ammunition, Shipborne, Airborne, Marker lights, Floats, Water-activated batteries, Sea water.

CONTENTS:
The Sound Gear Monitor; The Dynamic Monitor; The Overside Noise Monitor; Shipboard Instruments: I; Shipboard Instruments: II; Echo-Repeating Equipment; Attack Plotters; Attack Directors; Automatic Controls; Ordnance; Sea Markers; Sea-Water Batteries.

16. Medical Sciences

AD-438 144 Div. 16
OTS Prices: HC $1.00/MF $0.50

Geoscience, Ltd., La Jolla, Calif.
THERMAL AND ELECTRICAL CONDUCTIVITIES OF BIOLOGICAL FLUIDS AND TISSUES.
Annual rept. for 1 Apr 63-31 Mar 64,
by H. F. Poppendiek, N. D. Greene, J. H. Breeden, J. R. Murphy, and P. M. Morehouse. 31 Mar 64, 40p
GLR-24
Contract Nonr4095 00

Unclassified report

Descriptors: (*Body fluids, Conductivity), (*Tissues (Biology), Conductivity), Thermal conductivity, Electrical conductance, Blood, Urine, Stomach, Secretion, Enzymes, Bovines, Biophysics, Cryogenics, Muscles, Medical equipment, Temperature sensitive elements, Electrolytes (Physiology), Humans, Hemolysis.

The report describes research on thermal and electrical conductivities of biological fluids and tissues for the period April 1, 1963 to March 31, 1964. A literature search on thermal and electrical conductivity of biological fluids and tissues and on the techniques utilized in the cryogenic cooling of biological materials was conducted. Analytical studies have been initiated which will make it possible to estimate or establish the controlling variables of thermal and electrical conductivities of biological fluids and tissue; the results are to be used to correlate more effectively the experimental measurements being obtained. An existing thermal conductivity apparatus was modified and heat meters and specimen cells for the system were fabricated. Absolute thermal conductivity measurements were obtained for human blood, beef muscle, gastric juice and urine. Conductivity measurements for water were determined with the apparatus during the course of the experiments. A Sunderman conductivity apparatus was prepared for electrical conductivity measurements of biological fluids. A Wheatstone conductivity bridge and constant temperature bath facility were also constructed. (Author)

PB-160 082 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. PART I: SCOPE AND METHODOLOGY.
Research rept., vol. 10, p. 331-344,
by Friedrich Ellinger. 28 May 52, 14p
Proj. NM006 012 05 04

Unclassified report

Descriptors: (*Radiation effects, Drugs), (*Drugs, Radiation effects), Animals, X-rays, Dosage, Biological products, Ionization, Histological techniques, Biological assay, Health physics, Tissues (Biology), Mice, Desoxyribonucleic acids, Ribonucleic acids.

Interest in pharmacological studies on irradiated animals has considerably increased in recent years. Pertinent investigations may be divided into two groups: (a) studies undertaken from the point of view of experimental therapy in order to counteract the lethal effect of total body irradiation, and (b) studies undertaken in order to elucidate the mechanisms of the biological effects of irradiation by a pharmacological analysis. In order to facilitate studies in this field two main lines of approach in pharmacological studies utilizing the lethal effect of X-rays produced in total body irradiation are suggested: (a) use of various drug concentrations with one X-ray dose, preferably a dose close to the LD50 for 14 days for the particular animal species, (b) the use of one drug concentration with at least two radiation doses representing a mid-lethal, low-lethal, or high-lethal range. Preliminary data concerning the effects of desoxyribonucleic and ribonucleic acid as well as those of a spleen extract on the radiation induced mortality in mice are given in order to demonstrate the practical application of the procedures outlined in this paper. (Author)

PB-160 083 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS III: EFFECT OF SALINE ON RADIATION-INDUCED MORTALITY AND WEIGHT CHANGES.
Research rept., vol. 10, p. 693-700,
by Friedrich Ellinger and J. W. Blagg. 17 Nov 52, 10p
Proj. NM006 012 05 09

Unclassified report

See also PB-160 082

Descriptors: (*Body weight, Radiation effects), (*Radiation sickness, Sodium compounds), (*Drugs, Radiation effects), Injection (Medicine), Exposure, X-rays, Lethal dosage, Mice, Pharmacology, Chlorides.

In order to clarify the role of physiological sodium chloride injections in pharmacological studies on irradiated animals, the investigations reported in this paper have been undertaken and the following results have been obtained: (1) Daily injections of 0.3 cc. of 0.9 per cent NaCl solution into mice of 22 g ± 15 per cent body weight subsequent to the exposure to X-ray doses representing the LD60/14 days and LD30/14 days for periods of 14 and 6 days respectively caused a delay in the development of the mortality produced by these X-ray doses. (2) While the 14-day administration of saline did not materially change the X-ray-induced mortality rate, 6-day administration resulted in a statistically significant decrease of the mortality rate in mice exposed to the LD60/14 days. (3) The saline-induced change of X-ray mortality was also reflected in the weight curve of the animals. (4) The results obtained in this study indicate that saline cannot be considered as an inert agent in pharmacological studies on irradiated animals under all circumstances. This has to be kept in mind if and when the effect of a certain chemical dissolved in saline is used for a study of its effect on radiation-induced mortality. (Author)

PB-160 084 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. IV: WATER INTAKE OF GUINEA PIGS AS A PARAMETER FOR ORAL DRUG ADMINISTRATION IN EXPERIMENTAL RADIATION THERAPY.
Research rept., vol. 13, p. 787-794,
by Friedrich Ellinger. 8 Nov 55, 12p
Proj. NM006 012 05 15

Unclassified report

See also PB-160 083.

Descriptors: (*Radiation sickness, Water), (*Drugs, Radiation effects), (*Radiation effects, Drugs), Radiobiology, Guinea pigs, Lethal dosage, X rays, Diet, Mouth, Body weight, Countermeasures.

In the study of the effects of drugs on X-ray-induced mortality of experimental animals, the use of the oral route is preferable in many instances to the administration by injection because of the increased bleeding tendency exhibited by some of the laboratory animals. From

STUDY OF INTEGRATED CRYOGENIC FUELED POWER GENERATING AND ENVIRONMENTAL CONTROL SYSTEMS. VOLUME IV. ENVIRONMENTAL CONTROL AND ATTITUDE CONTROL STUDIES,
by A. Knights, A. Jennings, and M. Forte. Nov 61, 311p
Contract AF33 616 7508, Proj. 3145, Task 30328
ASD TR61 327 V4

Unclassified report

Legibility of this document in in part unsatisfactory. Reproduction will be made from best available copy. See also AD-270 474.

Descriptors: (*Manned spacecraft, Control systems), (*Control systems, Manned spacecraft), Stabilization systems, Attitude control systems, Cryogenics, Auxiliary power plants, Temperature control, Heat exchangers, Coolants, Humidity, Carbon dioxide, Oxygen, Hydrogen, Weight, Liquified gases, Propellants.

This study investigates methods for integration of environmental control and attitude control functions with the space vehicle auxiliary power system. Environmental control is achieved by dissipation of personnel and equipment heat loads in the cryogenic propellants prior to combustion. Attitude control is accomplished by extracting propellant from the power unit propellant supply system. Several arrangements are analyzed for each control function. The analysis indicates that an intermediate coolant circuit between the heat sources and the ultimate cryogenic heat sink is required. Gaseous of liquid-gaseous heat transport means are comparable to serve this purpose. For mission duration under 40 hours, humidity and carbon dioxide control within the personnel environment are best accomplished using non-integrated techniques. Integration of the reaction control system is intimately related to the particular thrust level and total impulse requirement, the frequency and duration of the pulses, and the type of prime mover employed. In general, applications which require high thrust level with long duration pulses will preclude integration in the over-all power generating and environmental control system. (Author)

13. Installations and Construction

PB-166 254 Div. 13, 4, 32
OTS Prices: HC $7.00/MF $1.75

Bechtel Corp., San Francisco, Calif.
COST STUDIES OF LARGE MULTI-STAGE FLASH SALINE WATER CONVERSION PLANTS.
Research and development progress rept.
Oct 64, 398p
Contract OSW14 01 0001 313
OSW PR116

Unclassified report

Descriptors: (*Sea water, Desalination), (*Desalination, Optimization), Electric power production, Water supplies, Economics, Costs, Evaporators, Design, Heating, Steam, Construction, Materials, Feasibility studies.

A study was made to determine the extent to which the costs of converting sea water to fresh water could be reduced as a result of (1) increasing the scale of operations to a very large size and (2) using exhaust steam from a gas-fueled power generating station to supply heat. The conversion plant design concerned is of the multi-stage flash evaporation type. It was found that water costs could be reduced about 20% when condition (2), above, is realized; and that an increase in operating capacity from 50 million gal/day to 150 million gal/day could effect a 24% reduction in water costs. The optimum brine heater outlet temperature for combination water-power plants is shown to be below 300F. Heat and material balances for optimized configurations, and capital cost estimates were developed.

PB-166 256 Div. 13, 4
OTS Prices: HC $3.00/MF $0.75

Kaye (Joseph) and Co., Cambridge, Mass.
STUDY OF MULTI-PHASE EJECTORS FOR FREEZING PROCESS DESALINATION SYSTEMS.
Research and development progress rept.,
by Clarence A. Kemper, George F. Harper, S. William Gouse, and John H. Leigh. May 64, 72p
Contract 14 01 0001 373
OSW PR118

Unclassified report

Descriptors: (*Sea water, Desalination), (*Desalination, Refrigeration systems), Water supplies, Freezing, Thermodynamic cycles, Evaporation, Ice, Separation, Coolants, Butane, Pumps, Friction, Irreversible processes.

A theoretical study was made of freezing process Multiple-Phase Ejector (MPE) desalination systems. To establish a baseline, an ideal reversible freezing process desalination system was compared to the ideal direct contact freezing MPE desalination system and the ideal flash evaporation freezing MPE desalination system. The results indicate a work-input of 2.56 Btu per lbm of fresh water for the ideal flash evaporation system, a work-input of 2.63 Btu per lbm of fresh water for the ideal direct contact freezing system, and a work-input of 2.29 Btu per lbm of fresh water for the ideal reversible freezing system. When irreversibilities due to ice-brine separator inefficiency, pump inefficiency, and viscous friction in the MPE are introduced into the systems, the results indicate that the direct contact freezing MPE desalination system requires a total work-input of 8.7 Btu per lbm of fresh water produced when operating with a sea water temperature of 70F, an ice-brine separator efficiency of 0.90, a butane condensing temperature of 70.5F and with MPE mixing section diameters of 1.5 inches which corresponds to a plant capacity of approximately 900 GPD. (Author)

14. Materials (Non-Metallic)

AD-438 137 Div. 14, 20
OTS Prices: HC $0.50/MF $0.50

General Dynamics/Fort Worth, Tex.
MATERIALS--CERAMIC BONDED SOLID FILM LUBRICANTS--EFFECTS OF IRRADIATION AND HIGH TEMPERATURE ON.
Test data memo. for 1 Apr-1 Oct 62,
by J. W. Head. 23 Oct 62, 12p FTDM-3053
Contract AF33 657 11214

Unclassified report

Descriptors: (*Lubricants, Radiation damage), (*Radiation damage, Lubricants), Films, Molybdenum compounds, Sulfides, Lead compounds, Boron compounds, Oxides, Calcium compounds, Fluorides, Graphite, Sodium compounds, Silicates, Cermets, Bonding, Wear resistance, Life expectancy, Friction, Solids, High temperature research, Materials.

An investigation was made of the effects of exposure to nuclear reactor radiation on wear life characteristics of three ceramic bonded solid film lubricants. Wear life determinations to be made at 3 different temperatures.

PREPARATION OF A SEROLOGICAL ANTIGEN AND A VACCINE FOR EXPERIMENTAL TSUTSUGAMUSHI DISEASE (SCRUB TYPHUS).
Rept. no. 9,
by Charles A. Bailey, Fred H. Diercks, and James E. Proffitt. 2 Apr 48, 22p
Proj. NM005 002 (X222)

Unclassified report

Descriptors: (*Rickettsia tsutsugamushi, Vaccines), (*Antigens and antibodies, Rickettsia tsutsugamushi), Embryonated egg technique, Casein, Immunology, Infectious diseases, Mice.

An antigenic suspension of Rickettsia orientalis was produced by the differential centrifugation of infected yolk sacs of embryonated hens' eggs. The purification was made possible by the use of casein hydrolysate as diluent. Mice vaccinated with such a purified rickettsial suspension resisted challenge to 20,000 MLD of R orientalis. The serological specificity of such a preparation has been shown by complement-fixation tests. (Author)

PB-160 103 Div. 16
OTS Prices: HC $2.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE PROGRESSION OF MORPHOLOGIC LESIONS IN SWISS MICE EXPOSED TO 625 r, 2000 KVP, TOTAL BODY X-RADIATION.
Research rept.
by Baldwin G. Lamson and John L. Tullis.
31 Jul 51, 28p
Proj. NM006 012 04 37

Unclassified report

Descriptors: (*Whole body irradiation, Mice), (*Morphology (Biology), Whole body irradiation), X rays, Spleen, Lymphatic system, Bone narrow, Intestines, Liver, Testes, Tolerances (Physiology), Hemopoietic system, Regeneration, Tissues (Biology), Mitosis.

One thousand Swiss male mice were exposed to 625 r, 2000 KV total body x-radiation. Nine hundred ninety of these mice were sacrificed serially, ten mice each hour for the succeeding 99 hours. Microscopic studies of the spleen, lymphoid tissue, bone marrow, intestines, liver and testes were made to observe the tissue response to this injury. Damage to lymphocytes, immature erythropoietic tissue and selected epithelial cells of the small bowel mucosa was observed one hour after exposure. Reduction of cellularity of myeloid tissue occurred more gradually. Damage to lymphoid tissue reached a peak between 7 and 12 hours, and regeneration was generally evident by 60 hours. Erythropoietic tissue could not be found after 14 hours, yet regeneration was seen sporadically between 66 and 99 hours. Peak injury to small bowel mucosa extended over the 8 to 32 hour period, whereas repair was completed by 60 hours after radiation exposure. Complete repair of lymphoid, erythropoietic and myeloid tissue did not occur during the 99 hours observation period. Mitotic activity was reduced for a period following irradiation in all organs studied with the exception of the testes. Selective damage to spermatogonia of the testes was not seen during the period of this study. (Author)

PB-160 104 Div. 16
OTS Prices: HC $2.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PROGRESSIVE DESTRUCTION OF RENAL HOMOGRAFTS ISOLATED FROM THE REGIONAL LYMPHATICS OF THE HOST.
Research rept., vol. 13, p. 913-942,
by David M. Hume and Richard H. Egdahl.
13 Dec 55, 50p
Proj. NM007 081 21 02

Unclassified report

Descriptors: (*Kidneys, Transplantation), (*Transplantation, Necrosis), (*Lymphatic system, Transplantation), Histological techniques, Surgical techniques, Immunity, Antigen-antibody reactions, Urinary system, Thrombosis, Edema, Hemorrhage.

There is considerable confusion as to the mechanism of homograft destruction. Some experimental evidence indicates that the regional lymphatics around a homograft may be necessary for the homotransplant reaction to take place. In the present study, the natural course of homotransplant destruction was followed in 37 dogs, with serial biopsies of the transplant and pathological studies at necropsy. To determine the role of the regional lymphatics in this process the kidneys in an additional 25 transplants were enclosed in a plastic envelope. This completely isolated the graft from the host except for vascular connections. In 6 cases a complete seal was obtained, and all showed typical patterns of homograft rejection. It is concluded that the regional lymphatics are not essential for renal homotransplant rejection in the dog. (Author)

PB-160 105 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE PROPAGATION OF JAPANESE ENCEPHALITIS VIRUS IN THE MOSQUITO BY PARENTERAL INTRODUCTION AND SERIAL PASSAGE,
by Herbert S. Hurlbut. 2 Aug 50, 10p
Proj. NM005 048 03 11

Unclassified report

Descriptors: (*Japanese B encephalitis virus, Culex), (*Disease vectors, Japanese B encephalitis virus), Viruses, Growth, Injection (Medicine), Bites and stings, Mice.

Propagation of the virus of Japanese encephalitis in Culex quinquefasciatus was demonstrated by parenteral injection and serial passage. The emulsified whole bodies of the mosquitoes gave LD50 titers of 6.5 - 8.4 when injected intracerebrally into mice. Virus could be demonstrated in appreciable amount 24 hours after injection into the mosquito and was present in relatively high concentration after 48 hours. Close to the maximum titer appeared to be reached on the third or fourth day and presumably there was no great change thereafter for as long as 17 days. Mosquitoes which were injected parenterally with the virus transmitted it to suckling mice by bite after as little as 48 hours of incubation at 30C.

PB-160 106 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A PROTEOLYTIC INHIBITOR WITH ANTICOAGULANT ACTIVITY SEPARATED FROM HUMAN URINE AND PLASMA.
Research rept., vol. 12, p. 421-434,
by N. Raphael Shulman. 26 Oct 54, 14p
Proj. NM006 012 04 77

Unclassified report

Presented in part to the Southern Section meeting of the American Federation for Clinical Research, New Orleans, La., 29 Jan 54.

Descriptors: (*Peptide hydrolases, Inhibition),

this point of view the present study has been undertaken. The drinking habits of guinea pigs were studied in order to ascertain the amount of daily water consumption which would serve as a parameter for oral drug administration. It has been shown that there is a difference between the water intake of non-irradiated and irradiated animals. This difference is chiefly accounted for by a reduced water intake of the animals, succumbing to the irradiation; these animals stopped drinking prior to death. It was noted that the water intake during the critical period for drug administration, the time prior to irradiation death, was not significantly changed irrespective of the mortality later on produced by various X-ray doses. The use of the oral administration of water-soluble drugs with drinking water appeared therefore possible with a sufficient degree of accuracy. (Author)

PB-160 085 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. PART V: THE EFFECTS OF POST IRRADIATION ADMINISTRATION OF VITAMIN K ON X-RAY INDUCED MORTALITY.
Research rept., vol. 14, p. 55-64,
by Friedrich Ellinger. 19 Jan 56, 14p
Proj. NM006 012 05 16
AD 98 988

Unclassified report

See also PB-160 084

Descriptors: (*Drugs, Radiation effects), (*Radiation effects, Drugs), (*Radiation sickness, Vitamin K), Injection (Medicine), Lethal dosage, Countermeasures, Hemorrhage, Liver, Fats, Tissues (Biology), Guinea pigs.

The counteraction of radiation-induced mortality by pharmacological means was investigated. Postirradiation protection of guinea pigs by vitamin K injection, starting on day zero shortly after irradiation and extending to the fifth postirradiation day, resulted in reduction of the LD39/15 days to LD6/15 days and of the LD73/15 days to LD43/15 days. There was no significant reduction in the mortality of the LD97/15 days. Autopsy findings indicated a reduction of the bleeding tendency, of the hemorrhagic manifestations and also of the fatty changes in the livers of the vitamin K-treated animals. No explanation for the observed effects was advanced. (Author)

PB-160 086 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PHARMACOLOGICAL STUDIES OF RADIOGERMANIUM (Ge71).
Research rept., vol. 10, p. 269-284,
by H. C. Dudley, E. J. Wallace, and L. J. Louviere.
29 May 52, 16p
Proj. NM006 012 04 55

Unclassified report

Descriptors: (*Pharmacology, Germanium), (*Germanium, Radiation effects), (*Radioactive isotopes, Germanium), Germanium compounds, Oxides, Sulfides, Chlorides, Toxic tolerances, Tissues (Biology), Laboratory animals.

A method for the determination of radioactive germanium (Ge71) in biological materials was developed and applied in the study of the pharmacological behavior of germanium oxide and some insoluble particulate germanium preparations. Results indicate that intraperitoneal injections of suspensions of GeO2, GeS2 and finely divided Ge are readily dissolved by the dog and rabbit. Excretion is rapid by way of the kidneys. At the end of 72 hours only trace amounts remain in any tissue. No significant tissue localization occurs. Germanium oxide appears to be pharmacologically inactive. Because of the low energy (9 Kv gamma) of Ge71, the biological effectiveness of this isotope is not significant. (Author)

PB-160 091 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PLASMA AMINO NITROGEN FOLLOWING SURGERY.
Rept. no. 2,
by Richard L. Burt and Harry R. Fallers, Jr.
23 Jul 48, 12p
Proj. NM007 040

Unclassified report

Descriptors: (*Metabolism, Amino acids), (*Amino acids, Metabolism), (*Surgery, Metabolism), Proteins, Nitrogen, Hemorrhage, Shock (Pathology), Wounds, Blood plasma, Parenteral infusions, Liver, Tissue extracts, Liver function tests, Body weight, Dogs.

Plasma amino nitrogen loading curves were obtained on three dogs with L-lysine monohydrochloride before and after surgical trauma (laparotomy). Following operation, alpha amino nitrogen was retained in the plasma at abnormally high levels after parenteral injection of the amino acid. This plasma retention did not appear to result from surgical anesthesia alone, and it could not be attributed to hepatic insufficiency because bromsulfalein retention was normal before and after operation. A defect in the fixation of alpha amino nitrogen by the tissues after injury is offered in explanation of the results obtained and its possible relation to certain clinical difficulties encountered in the restoration of nitrogen equilibrium by parenteral amino acid therapy is discussed. (Author)

PB-160 094 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
POTENTIAL VECTORS OF JAPANESE ENCEPHALITIS IN THE CAROLINE ISLANDS.
Rept. no. 5,
by Herbert S. Hurlbut and John I. Thomas.
20 Sep 48, 9p
Proj. NM005 007

Unclassified report

Descriptors: (*Japanese B encephalitis virus, Culex), (*Disease vectors, Japanese B encephalitis virus), Tropical regions, Infectious diseases, Mice.

Tests were made to determine whether the misquitoes, Culex quinquefasciatus Say and Culex annulirostris Skuse are able to transmit the virus of Japanese encephalitis to mice. The mosquitoes were infected by being fed an emulsion of infected mouse brain. Young mice bitten by these mosquitoes developed symptoms typical of encephalitis. The brains of these mice were shown to contain the virus of Japanese encephalitis in high titer by passage and by neutralization tests. These two species of mosquitoes bite man commonly and it is concluded that they should be considered potential vectors of Japanese encephalitis which is now known to occur on Guam and is possibly present on other tropical islands of the Pacific.

PB-160 098 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.

converts ATP to adenosine diphosphate, which is not strongly adsorbed. By this process, negative charge is eventually removed, and the repulsion due to the resulting net positive charge reextends the filaments. (Author)

PB-160 119 Div. 16
OTS Prices: HC $2.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
MODIFICATION OF THE GROWTH OF VIRUS IN THE CHICK EMBRYO BY THE USE OF HYALURONIDASE AND OTHER ADJUVANTS.
Research rept., vol. 11, p. 517-546,
by J. R. Kingston and Thomas G. Ward. 27 Feb 53, 30p
Proj. NM005 048 12 01

Unclassified report

Descriptors: (*Influenza virus, Growth), (*Embryonated egg technique, Influenza virus), (*Hyaluronate lyase, Embryonated egg technique), Infections, Permeability, Estrogens, Corticosteroid agents, Erythrocytes, Western equine encephalomyelitis virus.

Hyaluronidase, when injected into the chorio-allantoic cavity with the inoculum of PR8 influenza virus prior to incubation, increases the development of infectivity in the allantoic fluid which is demonstrable through the first 30 hours of incubation. This change is less easily demonstrated using hemagglutination techniques. When hyaluronidase is administered 18 to 24 hours after incubation a definite increase of hemagglutinins is seen early and the infectivity increases. The increase is not much greater than the peak production of the controls at a later period. Infectivity of the influenza viruses and western equine encephalomyelitis was increased slightly but not enough to be of practical importance. (Author)

PB-160 120 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A MODIFICATION OF THE REDEMANN SEMI-MICRO-KJELDAHL STEAM DISTILLATION APPARATUS WITH A NOTE ON THE DETERMINATION OF BLOOD UREA NITROGEN.
Rept. no. 1,
by Richard L. Burt. 20 Nov 47, 8p
Proj. NM007 040

Unclassified report

Descriptors: (*Urea, Blood chemistry), (*Blood chemistry, Laboratory equipment), Chemical analysis, Distillation, Nitrogen, Ammonium compounds, Sulfates.

A modification of the Redemann semi-micro-Kjeldahl steam distillation apparatus is described. Introduction of standard taper joints, all glass reaction vessels, smaller dimensions, and changes in baffle design facilitate analysis at the micro level. The excellent performance of the modified apparatus in the recovery of 0.05-0.10 mgm. of nitrogen from ammonium sulfate standards is indicated by representative analyses. The apparatus has been successfully employed in the determination of blood urea nitrogen. Steam distillation of the digestion mixture is possible when sorbitan trioleate (SPAN 85) is used as an anti-foam. The method permits duplicate analyses with less than 2 per cent error.

PB-160 121 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A MODIFIED SYNTHETIC MEDIUM FOR THE GENUS SHIGELLA.
Research rept., vol. 10, p. 117-132,
by Robert F. Ruhl, Frank Davis, and Laverne A. Barnes.
30 Jan 52, 18p
Proj. NM005 048 19 01

Unclassified report

Descriptors: (*Shigella flexneri, Culture media), Salts, Iron compounds, Sulfates, Ammonium compounds, Citrates, Potassium compounds, Phosphates, Vitamin B complex, Tyrosine, Tryptophan, Growth, Nutrition, Metabolism, Amino acids, Nicotinic acid.

Various synthetic mediums for the growth of Shigellas were investigated. The growth of a strain of Shigella flexneri III was measured in ten basic salt solutions supplemented with nine different energy sources. A basal medium consisting of ferrous sulfate, 2.0 mg per cent, diammonium acid citrate, 30.0 mg per cent, dipotassium acid phosphate, 10.0 mg per cent, niacin, 0.01 mg per cent, pyridoxine hydrochloride, 0.1 mg per cent, and L (+) cysteine, 2.0 mg per cent, plus supplements of either dextrose, 100 mg per cent, L-tyrosine, 75 mg per cent, or DL-tryptophane, 75 mg per cent or combinations of these were found to be the most satisfactory for the growth of S. flexneri III. The basal medium plus L-tyrosine, 75 mg per cent, supported comparable growth of fourteen other members of the genus Shigella. (Author)

PB-160 123 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
MORPHOLOGIC EFFECTS OF IRRADIATION ON THE SALIVARY GLANDS OF RATS.
Research rept., vol. 12, p. 9-20,
by James A. English. 1 Feb 54, 12p
Proj. NM006 012 04 66
AD 36 253

Unclassified report

Descriptors: (*Salivary glands, Radiation effects), (*Radiation effects, Salivary glands), X rays, Dosage, Morphology (Biology), Tissues (Biology), Tolerances (Physiology), Rats.

Salivary glands of rats were examined 16 hours to 100 days following application of 200 KVP X-ray radiation in doses of 1000 and 1500 r. A total of 162 rats were involved, 72 of them being used as litter-mate controls. Sufficient morphologic changes were observed in submaxillary salivary glands of animals sacrificed beyond the 15-day period to permit accurate separation of unmarked control and irradiated tissues. The changes consisted primarily of alteration in size, shape, and staining characteristics of nuclei of acinar cells. Changes were observed in other salivary glands, but were not characteristic enough to serve as invariable means of identification. A detailed description of the normal salivary glands of rats is given. (Author)

PB-160 124 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
MORPHOLOGY AND ENUMERATION OF HUMAN BLOOD PLATELETS,
by George Brecher and Eugene P. Cronkite.
8 Jun 50, 18p
Proj. NM006 012 04 28

Unclassified report

Descriptors: (*Blood platelets, Morphology (Biology)), (*Blood counts, Blood platelets), Anticoagulants, Oxalates, Blood coagulation, Hemopoietic system.

Changes in platelet morphology were studied with the

(*Anticoagulants, Peptide hydrolases), (*Enzymes, Peptide hydrolases), Proteins (Derived), Urine, Blood plasma, Pathology, Blood coagulation, Electrophoresis, Proteins, Trypsin, Ammonium compounds, Sulfates, Chymotrypsin, pH, Biochemistry, Purification.

The methods for purifying a proteolytic inhibitor with anticoagulant activity from human urine and plasma were described. The techniques involved were precipitation of the inhibitor by ammonium sulfate and ethanol and isoelectric precipitation at low ionic strength. The new inhibitor was relatively resistant to denaturing conditions. The reactions of the inhibitor with trypsin, chymotrypsin and various plasma proteolytic enzymes were studied, and were compared with the reactions of the soybean trypsin inhibitor. The combination of the inhibitor with trypsin was virtually irreversible at near neutral pH but the inhibitor could be recovered from the trypsin-inhibitor complex by treatment with 2.5 percent trichloroacetic acid. The molecular weight of the inhibitor was found to be approximately 16,700. The isoelectric point of the inhibitor was pH 2.8 and that of the trypsin-inhibitor complex was approximately pH 6.2. The reaction of the inhibitor with chymotrypsin and various proteolytic enzymes was reversible. The inhibitor had an anticoagulant activity similar to that of the soybean trypsin inhibitor. (Author)

PB-160 107 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PROTHROMBIN UTILIZATION IN FATAL RADIATION INJURY.
Research rept.
by D. P. Jackson, E. P. Cronkite, G. J. Jacobs, and C. F. Behrens. 26 Jun 51, 18p
Proj. NM006 012 04 36

Unclassified report

Descriptors: (*Blood coagulation, Radiation effects), (*Prothrombin, Radiation effects), (*Whole body irradiation, Blood coagulation), Blood counts, Hematocrit, Hematology, Blood platelets, Leukocytes, Anticoagulants, Hemorrhage, Lethal dosage.

Eight dogs were given 600 r, 2,000 K.V.P., 1.5 ma., H.V.L. 4.3 mm. Pb, 15.0 (±0.15) r per minute, whole body radiation by the bilateral exposure technique. The following studies were performed serially: hematocrit, white blood cell count, platelet count, prothrombin concentration (Ware and Seegers) whole blood clotting time, and prothrombin utilization (Buckwalter, Blythe, and Brinkhous). All eight dogs died between the ninth and fifteenth post-irradiation day. Clinically and at autopsy, all of the dogs exhibited evidence of extensive diffuse hemorrhage. The typical pancytopenia was demonstrated in all eight dogs. A slight terminal decrease in the concentration of prothrombin occurred in four of the dogs. The results indicate that prothrombin utilization after this amount of radiation approaches zero from the ninth post-irradiation day to death. The whole blood clotting time became prolonged only after the utilization of prothrombin approached zero and the platelet level had fallen below 50,000 per cubic millimeter. At autopsy, the blood clotted promptly after the vessels were cut, and the blood was allowed to escape into the tissues.

PB-160 108 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
PROVOCATION OF THE SHWARTZMAN PHENOMENON BY LOCAL INJECTION OF BACTERIAL FILTRATE.
Research rept., vol. 11, p. 1 85-1190,
by Henry A. Schlang and Joseph M. Pearce.
25 Nov 53, 6p
Proj. NM000 018 05 04

Unclassified report

Descriptors: (*Hemorrhage, Bacteria), (*Injection (Medicine), Bacteria), Serratia Marcescens, Escherichia coli, Wounds and injuries.

Injections of bacterial filtrates into lesions resulting from intradermal preparatory injections of similar bacterial filtrates may produce hemorrhagic necrosis. The hemorrhage may be produced with considerable regularity if the treated animal has had one or more injections of the bacterial filtrate a week before the experiment. (Author)

PB-160 115 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
METABOLIC STUDIES OF SALMONELLA ANATUM IN A SYNTHETIC MEDIUM WITH GROWTH CONTROLLING CONCENTRATIONS OF DL-ALANINE.
Research rept., vol. 10, p. 87-94,
by Frank Davis, E. H. Nilson, and L. A. Barnes.
4 Apr 52, 12p
Proj. NM005 048 19 02

Unclassified report

Descriptors: (*Salmonella, Metabolism), (*Culture media, Salmonella), Oxidation, Oxygen, Biochemistry, Microrganisms, Growth.

Metabolic studies were carried out employing Salmonella anatum over the concentration range of 0.8 through 160 micromoles per ml of DL-alanine. Rate of oxygen uptake determined on a standard Warburg apparatus remained constant from 24 to 104 micromoles and decreased as the concentration increased beyond 104 micromoles per ml. Both the D- and L- forms of alanine were equivalently utilized over a 60-minute experimental period. The complete oxidation of two micromoles of DL-alanine resulted in the consumption of three micromoles of oxygen. (Author)

PB-160 118 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A MODEL FOR THE ELEMENTARY PROCESS IN MUSCLE ACTION.
Research rept., vol. 10, p. 285-302,
by Manuel Morales and Jean Botts. 28 Mar 52, 18p
Proj. NM000 018 04 06

Unclassified report

Presented at the American Physiological Society Symposium on 'Demand and Supply of Energy,' Cleveland, Ohio, 30 Apr 51.

Descriptors: (*Muscles, Mathematical Models), (*Muscle proteins, Biophysics), Biochemistry, Adenosine phosphates, Entropy, Enzymes, Ionization, Molecules, Peptides, Thermodynamics.

Thermodynamic and molecular evidence is adduced in favor of the following theory for the elementary process in muscle action: In the resting state the lengths of the molecular filaments in myosin are a compromise between the contracting tendency of the intramolecular Brownian movement and the extending tendency of a net charge repulsion. This net charge is positive, due to the adsorption of divalent cations. The anion of adenosine triphosphate (ATP) adsorbs on the myosin discharging it, thus reducing or abolishing the repulsion; the filaments then contract, gaining configurational entropy. Enzymatic dephosphorylation eventually

dogs it was necessary to accelerate the clot formation in order to study the evolution of SPCA. This was accomplished by manual agitation, addition of thrombin, addition of excess amounts of thromboplastin, or addition of heavy concentrations of platelets. When the clotting of normal and irradiated blood was thus accelerated, the per cent enhancement by SPCA was higher than the per cent enhancement by SPCA of non-irradiated normal blood. In untreated irradiated blood with the usual prolonged clotting time there was more residual prothrombin in the serum causing a smaller evolution of SPCA and a per cent enhancement below normal. Mechanical and chemical acceleration of clotting resulted in less residual prothrombin in the serum, increased prothrombin conversion, and yielded a maximal evolution of SPCA showing the SPCA can be evolved and that the precursor is not inactivated by X-irradiation.

PB-160 131 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
OBSERVATIONS ON THE EXPERIMENTAL TRANSMISSION OF JAPANESE ENCEPHALITIS BY MOSQUITOES,
by Herbert S. Hurlbut and John I. Thomas.
31 Jan 50, 13p
Proj. NM005 048 03 10

Unclassified report

Descriptors: (*Japanese b encephalitis virus, Disease vectors), (*Culex, Japanese b encephalitis virus), Infectious diseases, Bites and stings, Lethal dosage, Mice.

The results of this research demonstrated that mice infected by the bite of Culex quinquefasciatus develop a sufficient concentration of virus in the blood to produce a transmissible infection in mosquitoes which feed upon them. Mice 3-5 days old when infected developed blood titers which ranged from 3.6 to 5.2, while those 7-12 days old had titers of 2.8-3.8. The mosquitoes transmitted the virus when infected by blood having titers of 2.8, 3.2, 4.5, and 5.2, respectively. The titer is expressed as the exponent of the reciprocal of the LD sub50 dilution. (Author)

PB-160 138 Div. 16, 4
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
ON THE THEORY OF THE DONNAN MEMBRANE EQUILIBRIUM.
Research rept., vol. 12, p. 221-240,
by Terrell L. Hill. 29 Jun 54, 20p
Proj. NM000 018 06 35

Unclassified report

Descriptors: (*Membranes (Biology), Osmosis), (*Osmotic pressure, Membranes (Biology), Electrochemistry, Semipermeability, Electrolytes (Physiology), Stabilization, Transport properties, Equations, Theory, Ions.

The Donnan membrane equilibrium is discussed using (1) the classical Donnan method (but introducing Debye-Hückel activity coefficient) and (2) the McMillan-Mayer method. In most of the report all ions are treated as point charges. If the potential of average force between ions in the outside solution (containing diffusible ions only) of the osmotic system is assumed to be of the Debye-Hückel limiting form, the second, third and fourth osmotic pressure virial coefficients are easy to calculate from the McMillan-Mayer equations. The McMillan-Mayer method leads directly to the osmotic pressure, by-passing the membrane potential and other details. However, in a special case, these can be calculated by combining the Donnan and McMillan-Mayer procedures. Both the Donnan and McMillan-Mayer methods have certain limitations, which are pointed out. (Author)

PB-160 139 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A ONE-INCH LUCITE CRANIAL WINDOW AND VITALLIUM HOLDER FOR INSTALLATION IN MONKEYS.
Research rept., vol. 10, p. 241-254,
by Elliott F. Osserman and David Minard. 3 Jun 52, 20p
Proj. NM007 081 07 07

Unclassified report

Descriptors: (*Monkeys, Brain), (*Brain, Medical examination), Head, Body fluids, Regeneration, Tissues (Biology), Acrylic resins.

A one-inch cranial window has been developed for installation in Rhesus monkeys. The frame consists of a cast vitallium ring with internal threads for the insertion of a threaded lucite window. The vitallium ring is contoured to fit the transverse curvature of the skull, and the flanges used for securing the ring to the skull are bent to conform to the AP curvature. This window can be installed in a single operation. An instrument for cutting the one-inch hole in the skull has also been developed. The rotary cutting tool is mounted on a duraluminum ring. Three steel points extending from this ring into the outer bony table of the skull provide rigid fixation of the skull with respect to the cutting instrument. This instrument provides a cut of sufficient accuracy that the fit is fluid tight, and the dura may be resected at the original operation. The removable window makes possible the debridement of exudate or regenerated tissue, and the direct application of materials to the surface of the brain. Nine of these window preparations have been made in this laboratory. All of these windows have been placed over the fronto-parietal area, but it is believed that other areas also will be accessible with this technique. (Author)

PB-160 140 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
ORAL MANIFESTATIONS OF IONIZING RADIATION. I. ORAL LESIONS AND EFFECT ON DEVELOPING TEETH OF SWINE EXPOSED TO 2000 K.V. TOTAL BODY X-RADIATION,
by James A. English and John L. Tullis. 29 Dec 50, 48p
Proj. NM006 012 04 34

Unclassified report

Descriptors: (*Teeth, Radiation effects), (*Radiation effects, Mouth), Whole body irradiation, Salivary glands, Histological techniques, Hemorrhage, Ulcers, Lymphatic system, Radiation sickness, Morphology (Biology), Pathology, Swine.

Oral tissues, salivary glands and developing teeth of 41 young swine were studied grossly and histologically to observe pathologic changes resulting from X-radiation. These swine were exposed to 2000 K.V. total body X-radiation. Gross changes in the oral mucosa consisted of petechial and ecchymotic hemorrhages in 49 per cent of the animals and marked ulceration in 9.8 per cent. Histologic study revealed irregular erosions of the mucosa in about 30 per cent of the animals and either petechial or massive hemorrhage around developing teeth or 70 per cent of the swine. Regional lymph nodes showed a high degree of sensitivity of X-radiation by exhibiting hemorrhage and depletion of lymphoid cells. Salivary glands were among the less sensitive tissues,

aid of the phase microscope. Rapid changes in platelet morphology were observed with all the anticoagulant solutions in common use, as well as with suspension of platelets in normal saline. It was concluded that changes reported in the past as characteristic of platelet behavior during the clotting process must be interpreted with caution because the techniques of examination in themselves influence platelet morphology. The observed changes in platelet morphology do not necessarily interfere with the ready identification of platelets as separate blood elements and a satisfactory technique for the counting of platelets was developed. The technique consists in rapid dilution of a sample of venous blood with 1% ammonium oxalate in a red cell pipette, and counting of the diluted sample in a conventional hemocytometer using the 43x phase objective and a long working distance phase condenser. With this technique the platelet count was subject only to those errors inherent in any blood cell count, namely the pipette, chamber and field errors of the count. The 95% range of single counts in 50 healthy males was 140,000 to 440,000 for fresh venous blood, with a mean of 257,000. In oxalated blood the mean was 232,000, the difference was statistically significant. (Author)

PB-160 125 Div. 16
OTS Prices: HC $2.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
MORTALITY IN SWINE AND DOSE DISTRIBUTION STUDIES IN PHANTOMS EXPOSED TO SUPER-VOLTAGE X-RADIATION,
by John L. Tullis, F. W. Chambers, Jr., J. E. Morgan, and John H. Zeller. 29 Aug 50, 30p
Proj. NM006 012 04 32

Unclassified report

Descriptors: (*Radiation effects, Swine), (*Whole body irradiation, Swine), Lethal dosage, Radiation hazards, Infections, Hemorrhage.

Lethal dose curves established for 110- to 160- pound swine exposed to 2000 KVP total body X-radiation at 2 meters TSD indicate that bilateral (one-half the total dose to each lateral aspect) irradiation is more lethal than unilateral (total dose to one lateral aspect) irradiation. The 2000 KVP bilateral X-radiation is also more lethal than 1000 KVP bilateral X-radiation. The LD50/30 values for each technique at 2 meters TSD are 350-400 r for 2000 KVP bilateral, 500 r for 2000 KVP unilateral, and 510 r for 1000 KVP bilateral exposure. Depth dose values taken throughout a 28 cm. phantom show that the internal distribution of incident radiation is more uniform when it is divided and administered bilaterally. In the case of 1000 KVP bilateral exposure, while the per cent air dose at the periphery is comparable with that in 2000 KVP bilateral exposure, the fall off in the mid-portion of the phantom is considerably more.

PB-160 126 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
MORTALITY IN SWINE EXPOSED TO GAMMA RADIATION FROM AN ATOMIC BOMB SOURCE.
Research rept., vol. 10, p. 651-662,
by John L. Tullis, Baldwin G. Lamson, and Sidney C. Madden. 7 Nov 52, 16p
Proj. NM006 012 04 59
AD 17 904

Unclassified report

Descriptors: (*Radiation effects, Swine), Lethal dosage, Gamma rays, Radiation sickness, Whole body irradiation, Nuclear explosions.

Seventy-nine swine were exposed in aluminum liners within identical, blast-proof, fireproof, aluminum cylinders to graded doses of gamma radiations from an atomic bomb source. They died between 5 and 19 days later as a result of radiation injuries sustained. The mortality was 100 per cent in seven test stations where doses of radiation between 320 r and 1000 r were received, 80 per cent at a station where the dose was 275 r and 20 per cent at a station where the dose was 180 r. The calculated 100 per cent lethal dose was about 390 r, the 50 per cent lethal dose was about 230 r and the 100 per cent survival dose was about 130 r. The doses of radiation were measured in air using ionization chambers calibrated in roentgen units. (Author)

PB-160 128 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
OBSERVATIONS ON IMMUNITY TO SHIGELLA INFECTIONS IN EMBRYONATED EGGS.
Research rept., vol. 13, p. 621-628,
by L. A. Barnes and I. B. Stacy, Jr. 13 Sep 55, 9p
Proj. NM005 048 04 21

Unclassified report

Descriptors: (*Shigella flexneri, Immunity), (*Embryonated egg technique, Shigella flexneri), Vaccines, Infections, Immune serums, Lethal dosage, Toxic tolerances, Dysentery, Microorganisms, Immunology.

The usefulness of embryonated eggs in studying certain characteristics of Shigella organisms is described. It was found that significant degrees of protection against S. flexneri 3 infection could be obtained by introducing suitable mixtures of either unconcentrated or concentrated inactivated homologous immune serums and virulent organisms into the chorioallantoic fluid of 8- or 9-day old embryos. Under the conditions employed, tolerance to LD sub 50 doses of standard culture suspension as high as 10 to the 6th power was attained. It was possible also to demonstrate the existence of an increased resistance to S. flexneri 3 infection subsequent to administration of homologous vaccines to 8-day-old embryos followed three days later by challenge with standard culture suspension; tolerance up to 10,000 LD sub 50 doses was observed, but the exact nature of this response was not fully explored. (Author)

PB-160 130 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
OBSERVATIONS ON SERUM PROTHROMBIN CONVERSION ACCELERATOR IN RADIATION INDUCED PANCYTOPENIA.
Research rept., vol. 10, p. 387-396,
by George J. Jacobs, Eugene P. Cronkite, and Sidney G. White. 3 Jun 52, 12p
Proj. NM006 012 04 42

Unclassified report

Descriptors: (*Whole body irradiation, Blood coagulation), (*Blood coagulation, Radiation effects), (*Prothrombin, Radiation effects), Blood platelets, Hemorrhage, Hemopoietic system, Blood transfusions, Bone marrow, Lymphatic system.

Eleven male mongrel dogs were given 600 r, 2,000 KVP, 1.5 ma., H.V.L. 4.3 mm. Pb, 15.0 (± 0.15) r per minute, whole body radiation by the bilateral exposure technique. A typical pancytopenia follows this dose of radiation, with the development of hemorrhagic syndrome. Studies were performed to determine the effect of radiation on the production of serum prothrombin conversion accelerator (SPCA of DeVries and Alexander) (Co-thromboplastin of Mann), by the technique described by DeVries and Alexander. Because of the prolonged clotting time in X-irradiated

PB-160 148 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A NEW CRITERION FOR THE SELECTION OF COMPOUNDS FOR CURATIVE ACTIVITY IN PLASMODIUM VIVAX MALARIA.
Research rept.
by Levon A. Terzian, P. A. Ward, and N. Stahler.
4 Oct 51, 12p
Proj. NM007 081 01 09

Unclassified report

Descriptors: (*Plasmodium, Quinolines), (*Drugs, Hemosporidia), Toxicity, Spores, Diseases, Aedes, Infectious diseases, Disease vectors.

This study showed that there is a specific relation between the toxic activity of a compound to the sporozoites of Plasmodium gallinaceum and its curative activity against the forms that produce relapse in Plasmodium vivax malaria. Thus, it was found that those 8-aminoquinolines (SN 13,274, 13, 276, 13, 429) with curative activity in P. vivax malaria equal to or greater than pamaquine, like pamaquine, are toxic to the sporozoites of P. gallinaceum in Aedes aegypti. As a consequence, the sporozoites in the salivary glands of mosquitoes maintained on these drugs are eventually destroyed, and the mosquito is sterilized of its infection. Furthermore, it has been shown that 8-aminoquinolines, and other compounds with no curative acitivity, or a curative activity below that of pamaquine, have no discernible effect on the sporozoites of this parasite. This relation should provide a reliable method for the evaluation of compounds for possible curative activity in P. vivax malaria, eliminating thereby the defects inherent in testing methods utilizing the vertebrate phase of experimental animal malarias. (Author)

PB-160 149 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
A NEW INSTRUMENT FOR RETRACTING THE WALLS OF BLOOD VESSELS TO FACILITATE INSERTION OF ARTIFICIAL TUBES.
Rept. no. 1,
by J. W. Thomas. 31 Mar 48, 6p
Proj. NM007 025

Unclassified report

Descriptors: (*Cannulation, Medical equipment), Blood vessels, Arteries, Surgical techniques, Polyethylene plastics.

An instrument was designed and constructed which facilitates the introduction of artificial tubes into blood vessels. It consists of an outside caliper to the tips of which are attached steel rockers controlling four small hooks which hold the vessel open.

PB-160 150 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE NON-SPECIFIC INHIBITION OF THE LECITHINASE ACTIVITY OF TYPE A CLOSTRIDIUM WELCHII TOXIN.
Rept. no. 6,
by Robert R. Wagner. 13 May 49, 12p
Proj. NM007 024

Unclassified report

Descriptors: (*Clostridium welchii, Immune serums), (*Immune serums, Clostridium welchii), Toxins and antitoxins, Phospholipids, Phosphoproteins, Animals, Humans, Enzymes, Heat tolerance, Inhibition, Toxic tolerances, Hydrolysis, Hemolysis, Rabbits.

Normal serum of several species of animals inhibits the hydrolytic action of Clostridium welchii lecithinase on lecitho-vitellin. Normal rabbit serum also reduces the extent of the hemolytic action of type A C1. welchii toxin. These inhibitory effects appear to be related to a non-specific substance in animal serum that is not present in human serum. This inhibitor is moderately heat labile and is distinguished from the markedly heat stable anti-enzyme of type A C1. welchii immune serum. The resistance of the lecithinase to destruction by heat is lost when sub-inhibitory doses of normal rabbit serum are added. It seems possible that the inhibitory effect of normal serum is due to the formation with the enzyme of a non-dissociable complex. Neither normal rabbit serum nor lecitho-vitellin affect the lethal action of type A C1. welchii filtrate. (Author)

PB-160 151 Div. 16, 14
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
NONSUTURE BLOOD VESSEL ANASTOMOSIS: AN EXPERIMENTAL STUDY USING POLYETHYLENE AS THE PROSTHETIC MATERIAL.
Research rept., vol. 13, p. 153-166,
by R. H. Egdahl and D. M. Hume. 29 Mar 55, 14p
Proj. NM007 081 19 01

Unclassified report

Descriptors: (*Polyethlene plastics, Prosthetics), (*Blood vessels, Prosthetics), (*Transplantation, Blood vessels), Medical equipment, Surgical techniques, Veins, Arteries, Fibrin, Thrombosis, Dogs.

Much work is being done at the present time to improve blood vessel grafts and enlarge the scope of their application. Relatively little work, however, is being devoted to the improvement of anastomotic techniques. This study evaluates the nonsuture method of anastomosis using polyethylene tubing as the prosthetic material. Intrinsic advantages of the nonsuture technique are simplicity, rapidity, and external support to the graft. Results of the study indicate that vein-lined polyethylene tubing may be used satisfactorily, at least for short intervals, as arterial prostheses in dogs. In the venous system, perforated vein-lined polyethylene prostheses were found to be preferable to solid vein-lined polyethylene prostheses because of external vascularization to the vein graft of the perforated tubes. Results with the prostheses were much more satisfactory in the external jugular vein of the dog than in the portal system because of a greater incidence of fibrosis, thickening and thrombosis in the vein grafts of the portal system prostheses. Venous homografts were found to be unsatisfactory compared with venous autografts for linings of the perforated polyethylene tubes. It is concluded that the nonsuture method of anastomosis using perforated polyethylene tubing is applicable, at least for short term follow-ups, in the arterial and peripheral venous system. (Author)

PB-160 158 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
LESIONS IN SWINE INDUCED BY TOTAL BODY EXPOSURE TO GAMMA RADIATION FROM AN ATOMIC BOMB SOURCE.
Research rept., vol. 11, p. 557-577,
by John L. Tullis, Baldwin G. Lamson, and Sidney C. Madden. 26 Feb 53, 24p
Proj. NM006 012 04 60
AD 17 905

Unclassified report

Descriptors: (*Whole body irradiation, Pathology), (*Radiation effects, Nuclear explosions), Lethal dosage,

with regard to morphologic change. However, a definite decrease of basic staining granules was observed in acute stages of radiation sickness, with complete recovery in 30-day survivors. A characteristic kind of hypoplasia of the enamel of developing molar teeth was observed among swine which received more than 400 r. Ameloblasts actively producing enamel matrix appeared to be sensitive to irradiation. Other portions of the teeth showed minimal effects. (Author)

PB-160 142 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE OXIDATIVE DISSIMILATION OF AMINO ACIDS AND RELATED COMPOUNDS BY SHIGELLA FLEXNERI 3.
Research rept., vol. 14, p. 437-444,
by Arvid L. Erlandson, Jr. and Robert F. Ruhl.
28 May 56, 9p
Proj. NM005 048 04 23

Unclassified report

Descriptors: (*Amino acids, Oxidation), (*Shigella flexneri, Amino acids), Biochemistry, Enzymes, Carbon dioxide, Ammonia, Nitrogen compounds, Aspartic acid, Glutamic acid, Ph.

Initial observations on the physiology and nutrition of Shigella flexneri 3 are discussed. Data on the enzyme systems of Shigella that are active in the dissimilation of amino acids are furnished. Manometric studies with resting cell suspensions of S. flexneri 3 have indicated that only 9 of 30 amino acids tested are oxidatively dissimilated by the enzyme systems of this organism. However, rate studies on oxygen consumption, carbon dioxide evolution, and ammonia production from these 9 indicate the enzyme systems involved in these reactions are very active. Further studies on those compounds actively dissimilated were carried out in order to characterize the reactions in terms of stereospecificity, substrate concentration effects, and pH optima. (Author)

PB-160 143 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
OXYGEN TOXICITY AND THE NERVE PULSE.
Research rept., vol. 13, p. 759-768,
by S. N. Stein and Phanor L. Perot, Jr. 7 Nov 55, 10p
Proj. NM004 005 09 01

Unclassified report

Descriptors: (*Toxicity, Oxygen), (*Neuromuscular transmission, Oxygen), (*Oxygen, Skeletal muscle relaxants), Amphibians, Nerves, Nerve impulses, Barometric pressure, Carbon dioxide, Central nervous system.

This study demonstrates that a conduction block is produced in frog sciatic nerve when exposed to oxygen at high pressure (12 atm.). The conduction block (defined as the absence of an action potential in a nerve when stimulated with the same electrical stimulus parameters which produced a good action potential at control levels) occurs in approximately 4.5 hours when a nerve is at 12 atmospheres oxygen. The nerve partially recovers on return to air at atmospheric pressure providing the block is not maintained for more than a few minutes. The time course of the block is not modified by continuous or intermittent stimulation. Nerves in 5 percent CO2-95 percent O2 are blocked in a similar fashion but with a shorter latency and the reversibility is more pronounced. Removing the perineurium also slightly reduces the latency of block by high pressure oxygen. It is suggested that hyperoxic conduction block as seen in peripheral nerve may play a role in initiating hyperoxic seizures in the central nervous system. (Author)

PB-160 146 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
NAVAL MEDICAL DEPARTMENT REFERENCE COLLECTION OF ENTEROBACTERIACEAE.
Research rept.
by Mary C. Babcock, James D. Gillmore, and L. A. Barnes. 12 Dec 51, 20p
Proj. NM005 048 04 14

Unclassified report

Descriptors: (*Libraries, Culture media), (*Medical laboratories, Enterobacteriaceae), (*Enterobacteriaceae, Medical research), Culture media, Salmonella, Shigella, Proteus, Pseudomonas, Epidemiology, Immunology, Antibiotics, Diseases, Indexes, Identification, Catalogs, Documentation, Military medicine.

A lyophilized culture collection of approximately 5000 Enterobacteriaceae cultures representing biochemically and serologically identifiable strains in the genera Salmonella, Shigella, Paracolon, Proteus and Pseudomonas, has been established. Replicate cultures are available from outbreaks of shigellosis and salmonellosis as well as isolates from both acute cases and carrier states. Available pertinent clinico-epidemiologic data are maintained on record. This reference library of enteric cultures provides the means for comparing the various antibiotic sensitivities, immunological differences and serological variance of new strains with those of standard types and older isolates. The lyophilized cultures and clinico-epidemiologic data are available for use by all Armed Forces establishments and civilian laboratories on request. (Author)

PB-160 147 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
NEOPLASMAS IN RATS PROTECTED AGAINST LETHAL DOSES OF IRRADIATION BY PARABIOSIS OR PARA-AMINOPROPIOPHENONE.
Research rept., vol. 11, p. 1153-1172,
by George Brecher, E. P. Cronkite, and James H. Peers.
20 Oct 53, 20p
Proj. NM006 012 05 12

Unclassified report

Descriptors: (*Parabiosis, Neoplasms), (*Neoplasms, Whole body irradiation), (*Radiation effects, Neoplasms), Lethal dosage, Cancer, Pathology, Intestines, Reproductive system, Rats.

Rats that survived otherwise lethal doses of radiation when protected by para-aminopropiophenone or parabiosis are followed along with their normal controls for the rest of their natural lives. Seventy animals have been irradiated. Of these, 22 have survived 6 months or more and in these survivors there has appeared an adamantinoma, renal carcinoma, sarcoma, adenocarcinoma of the duodenum, jejuneum, and of the ileum, glioma and adenocarcinoma of colon; and a uterine sarcoma between 6 and 16 months after irradiation. During this time no tumors have developed in control animals. The high incidence of tumors in this small group of animals, and the incidence of tumor types that seldom occur spontaneously, indicate that these neoplasms were induced by whole-body irradiation. (Author)

PB-160 177 Div. 16
OTS Prices: HC $2.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE DISTRIBUTION AND GROWTH OF ICE CRYSTALS IN FROZEN MAMMALIAN TISSUE.
Research rept., vol. 13, p. 1-30,
by H. T. Meryman and W. T. Platt. 3 Jan 55, 30p
Proj. NM000 018 01 08

Unclassified report

Descriptors: (*Frostbite, Dehydration), (*Tissues (Biology), Freezing), (*Ice, Tissues (Biology), Histological techniques, Viability, Liver, Muscles, Electrolytes (Physiology), Wounds and injuries, Biochemistry, Pathology.

Although tissue generally appears histologically normal after freezing and thawing, an investigation into the histology of tissue in the frozen state reveals the existence of many small intracellular crystals after rapid freezing and of huge extracellular crystals after slow freezing. Interpretation of this data and other available information leads to the conclusion that the extreme concentration of solutes during freezing rather than the mechanical trauma from ice crystals is the primary cause of tissue injury. This is a cumulative biochemical trauma with both time and temperature dependency. The normal appearance of tissue and cells following freezing and thawing does not necessarily indicate viability. (Author)

PB-160 178 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE DISTRIBUTION OF THE SOMATIC ANTIGEN OF A GRAM-NEGATIVE ORGANISM IN NORMAL AND TUMOR BEARING MICE.
Research rept.,
by W. G. Smith, R. F. Ruhl, and G. W. Imirie.
6 Jun 51, 16p
Proj. NM005 048 09 01

Unclassified report

Descriptors: (*Neoplasms, Toxins and antitoxins), (*Antigens and antibodies, Neoplasms), (*Salmonella, Toxins and antitoxins), Culture media, Trypsin, Distillation, Labeled substances, Cancer, Tissues (Biology), Microorganisms, Hemorrhage, Necrosis, Reticuloendothelial system, Toxicity, Mice.

The somatic antigen of Salmonella typhimurium was labeled by growing the organism in a medium of low phosphorus concentration containing Na2 HP(32)O4. Labeled antigen was extracted from the harvested organisms by a process of tryptic digestion and fractional precipitation in acetone. This labeled product was used to study (a) the fate of this highly toxic antigen in normal mice and (b) the question of selective localization of this agent in sarcomatous tissue. Somatic antigens of Gram-negative organisms produce a hemorrhagic necrosis in tumor tissue; this effect is confined to the neoplastic tissue of tumor bearing animals. The labeled antigen was administered intravenously to normal mice and to mice bearing the transplantable sarcoma 37. In order of decreasing concentration of P(32), antigen P(32), recovered from normal mice sacrificed at 4 hours was found primarily in liver, spleen, adrenals, lungs, mesenteric node, kidneys, and sternum. Approximately the same order holds for normal mice sacrificed at 24 hours post-injection. In tumor bearing mice sacrificed at 4 hours, antigen P(32) was found mainly in liver, spleen, lungs, adrenals, mesenteric node, kidneys and tumor. Tumor moved into tenth position in the 24 hour group.

PB-160 204 Div. 16, 7
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
AN AUTOMATIC RECORDING IMPEDANCE BRIDGE.
Research rept., vol. 11, p. 775-784,
by H. W. Shirer and J. W. Moore. 25 Nov 53, 16p
Proj. NM000 018 03 02

Unclassified report

Descriptors: (*Medical equipment, Recording systems), (*Muscles, Electrical impedance), (*Recording systems, Medical equipment), Resistance (Electrical), Tissues (Biology), Membranes (Biology), Electrolytes (Physiology), Permeability, Biophysics.

A servo operated, self-balancing Wheatstone bridge for continuous recording is described. It was designed to record the resistive component of the impedance of living tissue at any one of four preselected frequencies from 200 to 2,000 cycles per second. The impedance of from 0 to 1,500 ohms shunted by up to 1.0 microfarads is covered in two overlapping ranges. The reactive component balance is maintained by hand and is not recorded. (Author)

PB-160 205 Div. 16, 28
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
AN AUTOMATIZED TECHNIQUE OF INVESTIGATING DIFFERENTIAL SENSITIVITY TO AUDITORY INTENSITIES. I. THE INFLUENCE OF STEP SIZE AND INTERVAL BETWEEN STIMULI.
Research rept., vol. 14, p. 533-540,
by J. A. Moody, E. A. Jerome, J. P. Flynn, and T. J. Connor. 5 Jul 56, 9p
Proj. NM000 019 02 02

Unclassified report

Descriptors: (*Auditory perception, Thresholds (Physiology)), (*Psychoacoustics, Test methods), Audiometry, Hearing, Stimulation, Control systems, Automatic, Psychophysiology, Auditory signals, Reaction (Psychology), Reflexes, Psychomotor tests, Analysis of variance.

This report presents a set of measures of differential sensitivity to auditory intensities obtained from four subjects by the method of limits. The results are somewhat novel because they were obtained by a completely automatic control system that permits the presentation of stimuli at any rate within the subject's capacity to respond. It was found that subjects respond adequately at a rate (1 stimulus per second) that yields, on the average, over 13 momentary thresholds per minute, which represents about a 25-fold increase in efficiency over manually controlled techniques. This rapid rate of obtaining thresholds provides a precise method of detecting some of the temporal changes in auditory sensitivity. (Author)

PB-160 207 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE BIOCHEMICAL CELLULAR, AND BACTERIOLOGIC CHANGES IN THORACIC DUCT LYMPH OF DOGS EXPOSED TO TOTAL BODY IRRIDATION,
by Crawford S. Brown, Esther Hardenbergh, and John L. Tullis. 22 Jun 50, 22p
Proj. NM006 012 04 29

Unclassified report

Descriptors: (*Lymph, Radiation effects), (*Whole body irradiation, Lymph), Thorax, Cannulation, Blood proteins, Uric acid, Nitrogen, Blood, Glucose, Chlorides, Leukocytes, Bacteria, Blood coagulation, Body fluids.

Biochemical, cellular, and bacteriologic studies were conducted on thoracic duct lymph and blood in normal dogs and in dogs exposed to 500 r total body x-radiation. Lymph total protein fluctuated within the first fifty hours after irradiation then decreased at a slow, even rate. Uric

Thymus, Spleen, Bone marrow, Hemopoietic system, Lymphatic system, Gastrointestinal system, Testes, Ulcers, Necrosis, Edema, Hemorrhage, Radiation sickness, Swine.

Thirty-two swine were exposed to about 700 r total body gamma radiation from an atomic bomb source while caged in fire- and blast-resistant aluminum cylinders. Twenty-four of these were serially sacrificed in pairs at intervals from 4 hours to 6 days after irradiation and the remaining eight swine died spontaneously on days 6 and 7. Radiation-induced gross pathologic changes included reduction in size of thymus and spleen, gradual depletion of the bone marrow, hyperemia and inflammation of the gastrointestinal tract, and hemorrhage into various organs. Pulmonary edema, bacterial invasion, and hemorrhage in the gastrointestinal tract and other organs were conspicuous in animals dying spontaneously. Microscopic alterations resembled those produced by 600 r total body X radiation. Lymphocytes, erythroblasts, myeloblasts, spermatogonia and selected epithelial cells of the small intestine showed the most extensive changes. Destruction of lymphocytes in all lymphoid organs existed in the first animals sacrificed and was generally most extensive in animals killed at 7 1/2 hours. By 1 1/2 days the excess debris had been removed by phagocytosis, and lymphocyte repopulation was evident after the second day following exposure. A progressive decrease in bone marrow cellularity was first recognized at 7 1/2 hours. Cells of the erythropoietic series were first reduced in number followed by myelopoietic cells and megakaryocytes in that order. (Author)

PB-160 162 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
LOCALIZATION OF RADIATION EFFECTS ON RAT'S TEETH.
Research rept., vol. 14, p. 395-402,
by James A. English. 6 May 56, 8p
Proj. NM006 012 04 95

Unclassified report

Descriptors: (*Teeth, Radiation effects), (*Radiation effects, Teeth), Partial body irradiation, Head, Tissues (Biology), Cells (Biology), Histological techniques, Pathology, Rats.

Sixty-one weanling white rats were used in an experiment to determine whether radiation changes previously observed in developing teeth following 1500 r of 200 KVP local X-ray radiation were due to direct or indirect effects. Twenty-six animals were irradiated over the teeth and eight animals were irradiated over the posterior part of the head, the remainder of the body being protected by lead shields in both series. There were 19 and 8 littermate controls respectively for the two groups of radiated animals. Seven of the rats irradiated over the teeth were sacrificed 24 days or more following exposure and all of them were observed to have gross evidence of developmental changes in maxillary incisor teeth as determined roentgenographically. Histologic study verified that this change was similar to the type previously observed in radiated rats. None of the six animals irradiated over the posterior part of the head and sacrificed 24 or more days afterwards showed roentgenologic evidence of developmental defects in their teeth. These results clearly indicate that the changes observed were due to local effects upon the tooth forming cells rather than such things as the production of toxins or hormonal changes elsewhere in the body. (Author)

PB-160 169 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
DEPENDENCE OF LENGTH OF MUSCLE FIBERS UPON ATP CONCENTRATION.
Research rept., vol. 14, p. 1-14,
by J. J. Blum, T. D. Kerwin, and W. J. Bowen.
6 Jan 56, 18p
Proj. NM000 018 04 14

Unclassified report

Descriptors: (*Muscles, Adenosine phosphates), (*Adenosine phosphates, Muscle proteins), Metabolism, Glycolysis, Nucleotides, Enzymes, Magnesium compounds, Potassium compounds, Calcium, Chlorides, Electrolytes (Physiology), Biophysics, Tissues (Biology).

The steady state length of glycerol-extracted psoas fibers is a function of the concentration of ATP and not of the amount of ATP split. Reciprocal Michaelis-Menten constants for the glycerol-treated psoas muscle-ATP system have been obtained by measurements of length ($\bar{K}_L$) and of rates of dephosporylation ($\bar{K}_c$). $\bar{K}_c$ and V_{max} are essentially independent of diameter in the range of 200μ-600μ, but both increase if the dimensions are reduced to the order of 2μ. $\bar{K}_c$ and V_{max} remain approximately constant during storage in 50 percent glycerol for more than one year. At 0.3 M KCl, $\bar{K}_L > \bar{K}_c$ for fibers of 200μ-600μ in diameter, but for fibrils of about 2μ or less $\bar{K}_L$ is about equal to $\bar{K}_c$. $\bar{K}_L$ increases as $[KCl]$ increases and also increases if small amounts of Mg^{++} are added to fibers in 0.3 M KCl. Possible interpretations of the effects of KCl and of Mg^{++} or Ca^{++} are discussed. There is a linear relation between $\bar{K}_L$ of psoas fibers and the rate of shortening of myosin B threads.

PB-160 170 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
DESIGN AND CONSTRUCTION OF A RADIOCOBALT LARGE ANIMAL IRRADIATOR.
Research rept., vol. 11, p. 1219-1236,
by R. Harold Draeger, Richard H. Lee, Thomas E. Shea, Jr., Frank I. Whitten, and Maynard Eicher. 2 Dec 53, 24p
Proj. NM006 012 04 64

Unclassified report

Descriptors: (*Cobalt, Radiobiology), (*Gamma emission, Medical equipment), (*Medical equipment, Gamma emission), Radioactive isotopes, Gamma rays, Dose rate, Shielding, Pneumatic systems.

A large animal irradiator was designed and constructed utilizing 1200 curies of radiocobalt as a source of gamma radiation. The radioactive material is divided into 100 portions of approximately 12 curies which are contained in capsules within 60 pneumatic carrier tubes. The tube system connects two radiation chambers separated by a radiation shield. This arrangement permits either of the two chambers to be entered whenever the radioactive material is pneumatically transferred to the other. In one radiation chamber the carrier tubes are disposed in a radial manner providing a volume about 32 inches in diameter and 5 feet long in which a highly uniform radiation dose rate of about 20 r per minute is attained. In the other chamber the tubes are clustered as closely as possible providing a smaller volume about 10 inches in diameter and 30 inches long in which the radiation level is about 200 r per minute. The equipment is housed in a reinforced concrete building which is divided by a heavy radiation shield into two radiation exposure rooms and a control room. (Author)

(4,370 to 6,060F). The development of a surface recession technique for rate measurement in static and dynamic atmospheres at low pressures is described. Grain size and orientation are shown to influence the rate of oxidation. Transport of oxygen in the system is a rate-limiting factor in static or turbulent air. Oxygen partial pressure in the reaction chamber varies with the temperature, surface area, and system geometry. High-velocity jet impingement is required to provide a known and constant value of oxygen pressure. Gaseous transport is not rate limiting in pure oxygen at pressures below 3 mm Hg and temperatures to 2,200C (3,990F). Identical oxidation rates are obtained by tests in static, turbulent, or high-velocity oxygen and high-velocity air. Two transitions in oxidation behavior with increasing temperature are observed. A reduction in temperature dependency and an increase in pressure dependency occurs at each transition. At all pressures, rates reach a maximum and decrease with increasing temperature above about 2,200C (3,990F). Equations which predict rates of oxidation at pressures of .000001 to 3.0 mm Hg within ±20 percent of experimental values from three independent investigations are presented. (Author)

20. Nuclear Physics and Nuclear Chemistry

PB-160 173 Div. 20, 16, 25
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
DEVELOPMENTAL STUDIES OF PERSONNEL DOSIMETERS FOR IONIZING RADIATION. 1. BACKGROUND AND PRELIMINARY DATA ON THE USE OF ACTIVATED POTASSIUM BROMIDE CRYSTALS,
by Maynard Eicher. 29 May 50, 16p
Proj. NM006 012 04 27

Unclassified report

Descriptors: (*Dosimeters, Crystals), Nuclear warfare casualties, Radiation hazards, Radiological dosage, Ionization, Colorimetry, Crystal lattices, Color centers, Potassium compounds, Bromides, Absorption spectrum, Halides.

Color changes in alkali halide crystals induced by ionizing radiation are proposed for personnel dosimetry for rugged field use in atomic warfare and disaster planning. The theory of the color change is discussed and a method described by which the degree of coloration of potassium bromide can be greatly increased. The process of activation converts induced blue F centers in the crystal lattice to colorless U centers. Preliminary data and curves plotting the absorption coefficients of the crystals vs. dosage of 200, 400, and 1000kv X-rays and radium-gamma radiation are presented. (Author)

22. Ordnance

PB-166 233 Div. 22, 17
OTS Prices: HC $9.95/MF $3.00

Office of Scientific Research and Development. Div. 1.
HYPERVELOCITY GUNS AND THE CONTROL OF GUN EROSION.
Summary technical rept., vol. 1,
Ed. by John S. Burlew. 1946, declassified 2 Aug 60, 694p STR-1-1
AD 221 585

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from the best available copy.

Descriptors: (*Hypervelocity guns, Maintenance), (*Gun barrels, Erosion), (*Interior ballistics, Hypervelocity guns), Guns, Ballistics, Hypervelocity projectiles, propellants, Corrosion-resistant alloys, Metallography, Ordnance.

Contents:
Ballistics
Gun erosion
Erosive action of propellants
Erosion resistant materials
Improved machine gun barrels
Hypervelocity guns and projectiles

25. Physics

AD-429 006 Div. 25
OTS Prices: HC $3.00/MF $0.75

Antenna Lab., Ohio State Univ. Research Foundation, Columbus.
SOME EXPERIMENTAL MEASUREMENTS OF THE CHARACTERISTICS OF Q-SWITCHED LASERS,
by Raymond E. Whitacre. 15 Nov 63, 60p
OSURF-1579-5
Contract AF33 657 10824, Proj. 5237, Task 523704
N64 15365

Unclassified report

Thesis submitted to Ohio State Univ. as partial fulfillment for MA degree.

Descriptors: (*Lasers, Instrumentation), (*Camera shutters, Lasers), Ruby, Power, Kerr cells, Prisms (Optics), Polarization, Optical equipment components, Amplifiers, Calibration, Reflectors, Reflection, Measurement.

Measurements of the variation in peak power output from a Kerr cell Q-switched ruby laser and a rotating roof prism Q-switched ruby laser as a function of the parameters of the laser systems are reported. Emphasis is placed on optimizing the power output from the Kerr cell system by considering the effects of variations in pumping energy, output and reflectivity, delay time between flashlamp firing and Q-switching, reflector alignment and cavity length. A detailed description of the physical arrangement and the operation of the two systems is presented. (Author)

26. Production and Management

PB-166 246 Div. 26
OTS Prices: HC $1.00/MF $0.50

Ford Motor Co., Dearborn, Mich.
TITANIUM CARBIDE BASE CUTTING TOOLS, PART II.
Rept. no. 10, 1 Apr-30 Sep 57,
by Michael Humenik, Jr. and David Moskowitz.

acid and non-protein nitrogen levels in lymph increased within four hours following irradiation, but later decreased to slightly below normal. Lymph creatinine decreased within four hours following irradiation. After 18 hours it rose gradually toward the normal level. Sugar and chloride levels showed no appreciable change. The total number of white blood cells in lymph dropped precipitously within four hours after irradiation, and remained at a low level throughout the period of observation. Bacterial cultures of blood and lymph were negative. (Author)

PB-160 213 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE ECTOPIC DEVELOPMENT OF MALARIAL OOCYSTS.
Research rept., vol. 12, p. 309-316,
by A. Burns Weathersby. 6 Aug 54, 8p
Proj. NM005 048 20 02

Unclassified report

Descriptors: (*Aedes, Parasites), (*Hemosporidia, Growth), (*Plasmodium, Growth), Infections, Diseases, Germ cells, Parasitic diseases, Histological techniques, Stomach.

Aedes aegypti was artificially infected with Plasmodium gallinaceum by injecting chicken blood, containing a high percentage of gametocytes, directly into the haemocoel, thus by-passing the critical stomach wall phase. Serial sections were prepared from these mosquitoes 7 and 8 days following the injection of the parasites. Oocysts were found developing in most of the tissues and in all body divisions of 45.3 percent of these mosquitoes. Oocysts were found attached to the diverticula and foregut of only one individual, and none was seen on the stomach. These results indicated that the parasite could develop without stomach wall association and that the factors responsible for such development were distributed throughout the body and were not confined to the stomach wall of the susceptible mosquito. (Author)

PB-160 217 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
THE EFFECT OF AGE AND SEX RATIO ON THE MATING ACTIVITY OF ANOPHELES QUADRIMACULATUS SAY.
Research rept., vol. 12, p. 261-268,
by Levon A. Terzian and Nathan Stahler. 22 Jun 54, 9p
Proj. NM005 048 06 06

Unclassified report

Descriptors: (*Anopheles, Reproduction (Physiology), Males, Females, Adults, Sex, Aging (Physiology).

This report, which represents further studies in the laboratory biology of Anopheles quadrimaculatus, deals with the effects of the age of the male and female mosquitoes, and the male/female ratio within a group, on the rate of insemination of females. It has been demonstrated that the capacity of the males to inseminate sexually active females was at a low level during the first postemergence day and reached its peak during the third postemergence day. Thereafter, the sexual activity of the males declined only slightly up to and including the 20th day of adult life. It has also been shown that the ability of the females to become inseminated by sexually active males was likewise at a low level during the first postemergence day, but reached its peak on the fifth day. In contrast to the males, the rate of insemination in the females decreased sharply in the 10-day-old groups, and in the 15-and 20-day-old groups, mating declined even more markedly to very low levels. It has been further demonstrated that the ratio of males to females influences the proportion of females to become inseminated within a group. Thus, the lowest rate of inseminated females occurred in those groups with 10 percent or less of males, while the greatest proportion of inseminated females were found in those populations with about 85 percent males. In experimental groups consisting of 95-97.5 percent males, however, there was a decline in the rate of females inseminated. This decline was more evident in those experiments performed during the winter months and may be related to seasonal changes in the mating activity of A. quadrimaculatus in the laboratory. (Author)

PB-166 099 Div. 16, 32
OTS Prices: HC $2.00/MF $0.50

Hawaii Agricultural Experiment Station, Honolulu.
AN EXAMPLE OF LEAST-COST RATIONS FOR OAHU DAIRIES.
Agricultural Economics rept.,
by Douglad J. McConnell, Richard W. Stanley, and Mao Lin Liu. Nov 63, 28p HAES-AER-64

Unclassified report

Descriptors: (*Milk, Hawaii), Economics, Agriculture, Bovines, Nutrition, Costs, Industries, Production, Linear programming.

The dairy industry in Hawaii is dependent upon imports: cows, feed, and equipment are largely imported from the mainland. Among the feeds available in quantity to dairymen on the island of Oahu, only pineapple bran, pineapple silage, pineapple hay, and molasses originate in Hawaii. Limited amounts of alfalfa, Rhodes grass, and Napier grass are also available. The great bulk of the dairy feed must be imported from the U. S. Mainland and foreign countries. Such heavy dependence on imported supplies contributes to the high cost of milk production in Hawaii. Feed cost is by far the largest single item in the cost of producing milk. In 1959, feed costs alone accounted for 45.6 percent of total costs of producing milk on Oahu. This figure far surpasses any other single cost item. The cost of feed to Oahu dairies is high not only as a percentage of total costs but also in actual dollar terms when compared with costs in other states. Linear programming is an analytical tool which has been widely used elsewhere in the United States for determining least-cost livestock rations. To test the feasibility of using programming in Hawaii, a representative dairy feeding problem has been solved by this method and the results are summarized in this report.

17. Metallurgy

PB-166 126 Div. 17
OTS Prices: HC $2.00/MF $0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
OXIDATION OF TUNGSTEN AT ULTRA-HIGH TEMPERATURES.
Technical rept.
by R. A. Perkins, W. L. Price, and D. D. Crooks.
Nov 62, 47p LMSC-6-90-62-98
N63 18738

Unclassified report

Descriptors: (*Tungsten, Oxidation), (*Oxidation, Tungsten), High-temperature research, Air, Oxygen, Pressure, Phase studies, Reaction kinetics.

The oxidation behavior of tungsten in air and oxygen has been studied as a function of pressure (0.1 to 5.0 mm Hg) and gas dynamics at temperatures from 1,300 to 3,350C

PB-166 110 Div. 31, 10
OTS Prices: HC $5.00/MF $1.00

Permutit Co., Paramus, N. J.
RESEARCH AND DEVELOPMENT FOR A SHIPBOARD OIL AND WATER SEPARATION SYSTEM.
Technical rept.
by S. Lenox, W. S. Young, A. W. Kingsbury, A. Duggan, and J. Ciancia. Jun 63, 154p
Contract MA2722

Unclassified report

Descriptors: (*Fuel oil, Separation), (*Water, Separation), Liquid filters, Monitors, Cargo ships, Fuel tanks, Ballast, Colloids, Water pollution.

An investigation was made to develop a 'package' type unit suitable for shipboard separation of ballast water from Bunker 'C' fuel oil. A 'State of the Art' survey showed that existing commercial methods of separation depended upon specific gravity differences or required equipment unadaptable to shipboard use. A means of separation was developed which involved the use of a capacitance probe to divert the relatively small amount of ballast water containing over one percent oil to a holding tank or existing ballast tank. The remainder of the ballast water containing less than one percent oil would be passed through a series of Dutch weave coalescing screens. This treatment would reduce the oil concentration to 100 - 200 parts per million, further reduction being accomplished by means of a replaceable fibre glass cartridge. The practical operation of such a system would be demonstrated by a full-scale land-based experimental installation. (Author)

32. Miscellaneous Arts and Sciences

PB-166 107 Div. 32
OTS Prices: HC $2.00/MF $0.50

Linguistics Research Center, Univ. of Texas, Austin.
Q-COLLECTIONS AND CONCATENATION,
by David A. Senechalle. Jan 63, 29p LRC-63-WTM1
Grant NSF GN54

Unclassified report

Descriptors: (*Mathematical models, Language), (*Language, Mathematical models), Theory, Analysis.

The purpose of the paper is to provide the foundation for a mathematical model for the syntactic description of written language. Mathematically the paper is self-contained. No knowledge of linguistics should be necessary to understand the material.

PB-166 122 Div. 32, 30
OTS Prices: HC $1.00/MF $0.50

Linguistics Research Center, Univ. of Texas, Austin.
TOWARDS MACHINE TRANSLATION,
by W. P. Lehmann. Apr 64, 18p LRC-64-WA2
Grant NSF GN208

Unclassified report

Descriptors: (*Language, Theory), (*Machine translation, Theory), Computers, Vocabulary.

The article gives a general discussion of linguistics and the place of the computer in linguistic research, especially in machine translation.

PB-166 175 Div. 32, 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
GOVERNORS OF THE CONJUNCTION YTO,
by J. H. Pustula. 22 Feb 60, 26p P-1978

Unclassified report

Descriptors: (*Vocabulary, USSR), Language, Dictionaries, Machine translation, Physics, Computers.

The Russian subordinate conjunction 'that' introduces noun clauses. This paper lists all of the words and idioms that have been found to govern 'that' clauses in the RAND corpora of Russian physics text. (Author)

PB-166 176 Div. 32, 30
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
STUDIES IN MACHINE TRANSLATION--4: MANUAL FOR PRE-EDITING RUSSIAN SCIENTIFIC TEXT.
Research memo.
by D. G. Hays, E. K. Renner, and D. V. Mohr.
4 Dec 59, rev. 15 Jun 61, 40p RM2065-1
Contract AF49 638 700

Unclassified report

Descriptors: (*Machine translation, USSR), Standards, Punched cards, Vocabulary, Computers, Programming (Computers), Reports, Numbers, Language.

This manual describes the methods now in use for research on machine translation and the general approach that is being followed, as well as its philosophy and method. The present manual is designed for the use of editors who prepare text for keypunching.

PB-166 183 Div. 32, 30
OTS Prices: HC $1.00/MF $0.50

Patent Office, Washington, D. C.
THE APPLICATION OF RANDOM ACCESS TECHNIQUES TO CASE LAW,
by D. D. Andrews. 6 Aug 61, 12p

Unclassified report

Presented at the Symposium on Information Retrieval, American Bar Association, St. Louis, Mo.

Descriptors: (*Information retrieval, Data processing systems), (*Law, Information retrieval), Search theory, Data storage systems, Computers, Selection, Indexes, Subject indexing.

The cases would be digested, possibly by a simple underlining operation on the text followed by a key punching of the extracted material only onto paper tape or cards. The extracted material would be only the facts stated in the case and would not include any legal conclusions the court may have chosen to draw from these facts. A huge dictionary or thesauris would be machine prepared from the key punched material extracted from the cases to enable the user to select all properly related terms or synonyms which are to be the basis of an individual search. A random access search file would be automatically prepared by machine from the key punched material. (Author)

PB-166 185 Div. 32, 30
OTS Prices: HC $1.00/MF $0.50

Patent Office, Washington, D. C.
MAJOR FACTORS GOVERNING THE SELECTION OF MACHINE DATA HANDLING TECHNIQUE,
by D. D. Andrews. 10 Sep 57, 10p

Unclassified report

30 Sep 57, 10p
Contract AF33 600 32448
AD 152 281

Unclassified report

Descriptors: (*Cutting tools, Cermets), (*Cermets, Cutting tools), (*Titanium compounds, Carbides), Machining, Performance (Engineering), Life expectancy, Wear resistance, Sintering, Vacuum, Hydrogen, Fracture (Mechanics), Nickel alloys, Molybenum alloys, Power alloys.

Standard machinability tests have been continued during the last period on tool compositions showing optimum life. Tool performance data, showing good reproducibility of tool wear, have been obtained on both hydrogen and vacuum-sintered specimens. A tendency toward formation of hairline fracture during cutting tests has been observed on these compositions, and present investigations are aimed at determining and eliminating the cause of this behavior. (Author)

29. Quartermaster Equipment and Supplies

PB-166 166 Div. 29, 16, 20
OTS Prices: HC $5.00/MF $1.25

Army Natick Labs., Mass.
RADIATION PRESERVATION OF FOODS PROGRAM. PROCEEDINGS OF CONTRACTORS' MEETING (8th), U. S. ARMY NATICK LABORATORIES, NATICK, MASSACHUSETTS, OCTOBER 7-9, 1963,
ed. by Frank R. Fisher and Edward S. Josephson.
1964, 196p

Unclassified report

Sponsored in part by the Advisory Board on Military Personnel Supplies, NAS-NRC.

Descriptors: (*Irradiated food, Symposia), (*Food, Preservation), Radiation effects, Nutrition, Purification, Packaging, Microbiology, Dosimeters, Army personnel, Pasteurization, Radiobiology.

Contents: The army radiation preservation of foods program; Product development; Wholesomeness, nutritional adequacy, and microbiology; Development of radiation facilities; Economic aspects and prospects of commercialization of radiation pasteurized foods; Wholesomeness of foods preserved by cold-sterilization and induced radioactivity; Present status of the wholesomeness program; Biochemical aspects of food radiation; Radiation microbiology program philosophy; Radiation microbiology program progress report; Troop acceptance tests of irradiated foods; Packaging for radiation sterilized foods; Dosimetry and dose distribution; Accelerators for food preservation.

30. Research and Research Equipment

PB-166 228 Div. 30, 8, 22, 23
OTS Prices: HC $6.00/MF $1.25

Office of Scientific Research and Development. Div. 17.
COMBAT TRAINING EQUIPMENT AND TESTING DEVICES.
Summary technical rept., vol. 4,
ed. by F. L. Yost. 1946, declassified 17 Jul 58,
254p STR-17-4
AD 200 805

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Training devices, Warfare), (*Test equipment, Military requirements), (*Warfare, Training devices), Telemeter systems, Fire control systems, Magnetic recording systems, Oscillographs, Radiography, Bomb auxiliary equipment, Timing devices, Measuring devices (Electrical And Electronic), Pulse counters, Projectiles, Gas analysis, Noise generators, Combat noise.

Contents:
Telemetering of Strain Gauges and Instruments
The Acoustic Firing Error Indicator
Magnetic Recording Research
Oscillographs
High-Voltage X-Ray Radiography
Bomb Instrumentation
Deflection-Time Measuring Devices
Measurement of Wall Thicknesses of Hollow Steel Propeller Blades
Development and Applications of Electronic Counter Circuits
Development of Methods for Detecting Defective Rotating Bands on Projectiles
Helium-Purity Indicators
Battle Noise Reproduction for Training and Screening Battle Personnel
Sound Spectrum of Ordnance Equipment and Battle Noises.

31. Ships and Marine Equipment

PB-166 108 Div. 31
OTS Prices: HC $3.00/MF $0.50

Institute of Engineering Research, Univ. of California, Berkeley.
THE INFLUENCE OF FRAME SPACING VARIATION ON FACTORS AFFECTING THE COST OF A TRANSVERSELY FRAMED VESSEL,
by H. -G. Schultz. Dec 63, 57p NA-63-8
Contract MA2620, T. O. 2

Unclassified report

Descriptors: (*Ship hulls, Design), (*Cargo ships, Costs), Ship structural components, Loading (Mechanics), Mathematical analysis, Structures, Stresses, Weight, Ship plates, Thickness, Beams (Structural), Buckling (Mechanics).

The Mariner Class dry cargo ship was investigated to establish a correlation between the ship construction costs and the frame spacing, based on the principles of structural analysis. The theoretical analysis is based on the stress behavior of the Mariner Class dry cargo ship as presented in Maritime Administration's plans, and Russo and Sullivan, under loading conditions as required by the Classification Society. This stress investigation includes the determination of all kinds of stresses, longitudinal and transverse bending stress components as well as shear stresses, and the consideration of buckling behavior.

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						PB-166 256	S-4

Presented at the Meeting of the American Chemical Society (132nd), New York.

Descriptors: (*Information retrieval, Data processing systems), (*Data processing systems, Selection), (*Patents, Information retrieval), Search theory, Programming (Computers), Machines, Analysis, Identification, Documentation.

A description is given of the procedure used by the Patent Office to retrieve information by machines.

PB-166 191 Div. 32, 30
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Texas Univ., Austin.
MACHINE LANGUAGE TRANSLATION STUDY: RESEARCH ON THE MACHINE TRANSLATION OF GERMAN.
Quarterly rept. no. 5, 1 May-31 Jul 60,
by W. P. Lehmann and E. D. Pendergraft. 31 Jul 60, 68p

Contract DA36 039sc78911
AD 247 613

Unclassified report

Descriptors: (*Machine translation, Digital computers), (*Language, Theory), Programming (Computers), Design, Coding.

Conventions are explained for coding a multi-level phrase structure grammar with transformational properties which are supported by specific analysis and synthesis processes. Programming aids for the compilation and verification of such grammars are described. The compiling procedure will be a research cycle with the following basic functions: (1) corpus revision, (2) grammar revision, (3) grammatical analysis of corpora, (4) analysis revision, (5) computation of rule frequencies in recorded analyses, (6) computation of analysis probabilities, and (7) synthesis of transformations of analyses. Coding errors and other imperfections in the grammars will also be displayed by the cycle. Heuristics for choices between alternatives in analysis and synthesis were planned. The projected methods of grammar compilation and verification are thought to be more efficient than trial translations. (Author)

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